

POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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SEE PAGE 734



More Speed! - by Sir Malcolm Campbell

Come INSIDE the engine and SEE why Ethyl is better



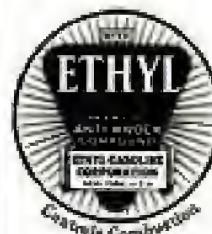
ORDINARY GASOLINE is in the cylinder. You see the spark in the picture at the left. In the next the gasoline vapor starts to burn. More—more—more burns. Then suddenly, in the sixth picture—**BANG!** The remaining unburned gasoline explodes. That is **KNOCK**. The last picture shows nothing but afterglow. Knock wasted the gasoline that should be working now.

ENGINEERS in General Motors' Research Laboratories wanted to see how Ethyl controls the combustion of motor fuel, thus preventing harmful knock, overheating and power-waste.

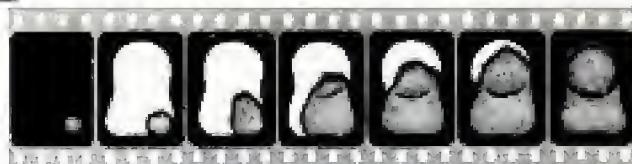
By fitting a quartz window into the top of a modern high compression motor they *watched* gasoline at work—took high-speed photographs of the actual combustion of motor fuels. Below at the left—ordinary gasoline knocking. Right—Ethyl Gasoline burning powerfully.

Look at these pictures and you will understand why more car owners buy Ethyl than any other brand of motor fuel. You will understand why nearly every manufacturer of cars now offers high compression engines designed to take advantage of the universal distribution of Ethyl.

Fill your car with the new, even higher quality Ethyl Gasoline and *feel* the difference you see in the pictures below. Ethyl Gasoline Corporation, New York.



The quality of Ethyl Gasoline is maintained by laboratory inspection of samples collected daily in all parts of the country. Ethyl fluid contains lead.



ETHYL GASOLINE starts from the spark in the same way—as shown in the first three pictures. But Ethyl can burn at only one speed: the right speed. See how its flame spreads *slowly* from start to finish. It is not all burned until the last picture—delivering its greatest power when the piston is going down—the time when power counts most in the performance of your car.

Buy ETHYL GASOLINE

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a Fortune

Chicago—1925—A Tribune ad—"Partner Wanted with investment." I inquired, investigated, invested a big part of my savings in what everyone said was a "foolish gamble"—and in the next 10 months had the satisfaction of starting over 250 men and women in the biggest money business of their lives. Many made over \$10,000 the first year. Many are still coining money on the start I gave them. I made a fortune myself—retired—worked six years on an idea even better than the first. Almost gave up trying—

Then-The Startling Invention That Can Pay You \$61⁶⁰ a Day!

Now, to men with vision, ambition, and the intelligence to recognize opportunity, I can offer a business—readily made—ready to start tomorrow—complete in every way—in which the possibilities for making money are so great that there is no way to measure the future it holds—the fortune it may bring you!

Fortunes in Dimes!

I say "men with vision" because this opportunity is for men who—like Woolworth and Wrigley—realize the immense fortunes that lie in "little things." To give you an idea: After seven years some of the figures come back to me—records of the money made in this business by the men I started in 1925. Mr. Ransom started in a little Illinois town—made \$200 a month net profit. Sullivan, in Indiana, made \$4,000 in 4 months. McLain, in Kentucky, made \$600 a month. In a little shop in Chicago, Brooks made \$500 a month net. I could give you scores of such figures. But the point is, their profits came in nickels and dimes.

Old Yet NEW!

The business I am going to start you in is a simple business. But that will not stop men of vision from seeing the immense profits it can yield. It is old and tried and proved. Yet my invention makes it NEW. Now it is different, bigger, more profitable. Now it stirs the imagination of the public—sweeps like wildfire across the country. This business of which I speak is built upon the sound foundation of the basic food success of the decade—crisp, delicious, golden brown Potato Chips.

An Accident Leads to Success!

I am the pioneer in the Potato Chip Industry. I was instrumental in marketing the first machine ever sold for making Potato Chips. And while I showed many men the way to the biggest earnings of their lives, the number of men I could help to a start was limited—for the machine cost so much to build that it had to be sold for \$1,500. Not many men could pay that much. The machines were big, cumbersome and difficult to operate. So I worked to make a machine

so simple and inexpensive that anyone could afford to go into this profitable business. How well I succeeded you soon shall see. For the cost of my new machine is but a small fraction of my original machine. But during my experiments something happened that was of the utmost importance. While working at the design I made the most revolutionary cooking discovery of the decade—an astonishing new kind of chip.

"Mineralized" Chips

I discovered how to retain the *9* life giving minerals—naturally found in

chips yourself, at retail, you can make \$69.60 gross profit every eight hours—on one machine.

I Help You Start

A machine alone cannot make money. But since there is probably no one in America who knows as much about the manufacture and sale of potato chips as I do, I am fully capable of giving you complete plans for making a profit. Easy enough to run a machine. But I am not satisfied until you are running that machine at a big profit to yourself. To men who can see the immense money making possibilities in this business I am prepared to submit a proposition to which every problem has been worked out in black and white, which is fool-proof, and which enables you to start making money at once without any past experience or knowledge of the business. I have everything prepared from A to Z and I can put it into your hands like a tool—a tool you can put to work for you at once. And you can start this valuable business—with it all right—for less than your potential income for the first week.

Be First to Profit

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H. ADAMS, President,
Vitasealed Potato Chip Company
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model 739-Railway
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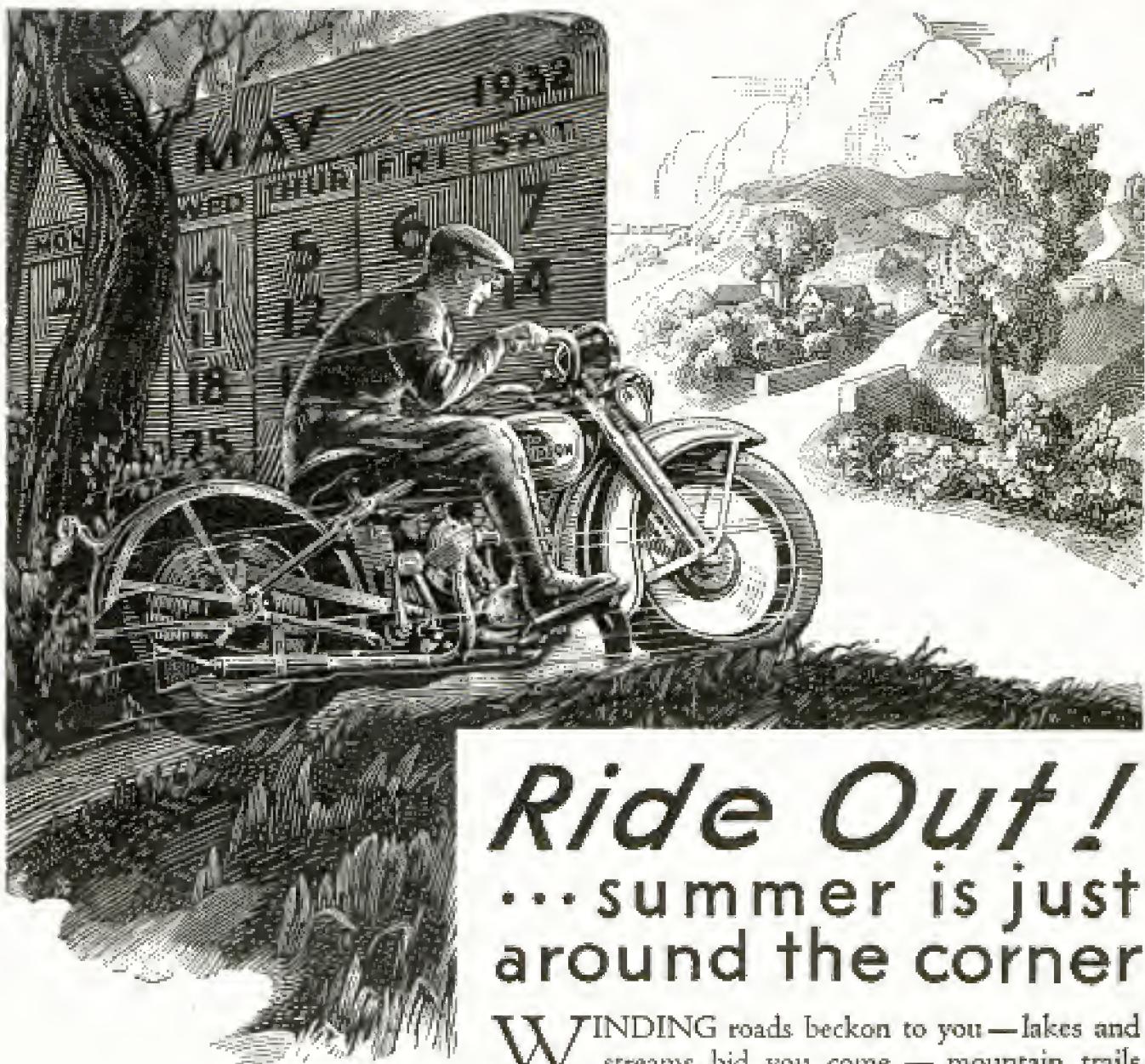
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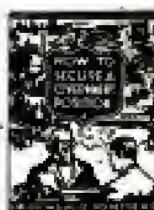
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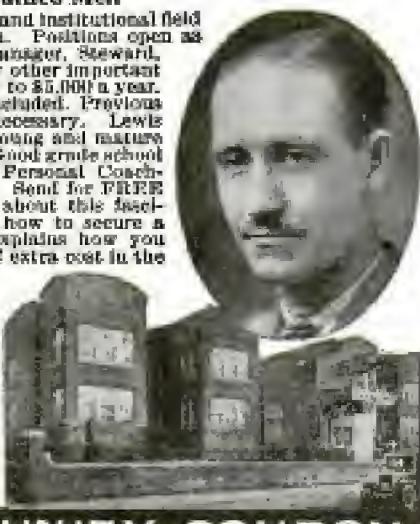
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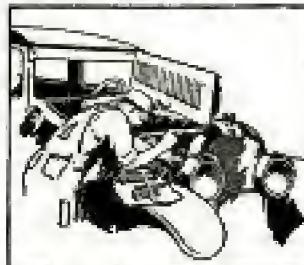
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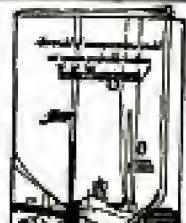
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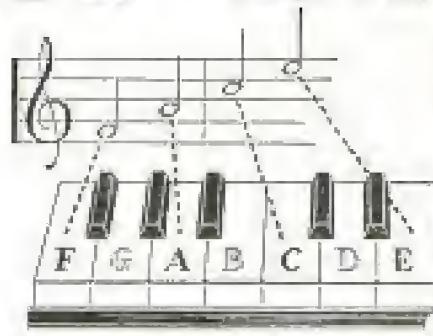
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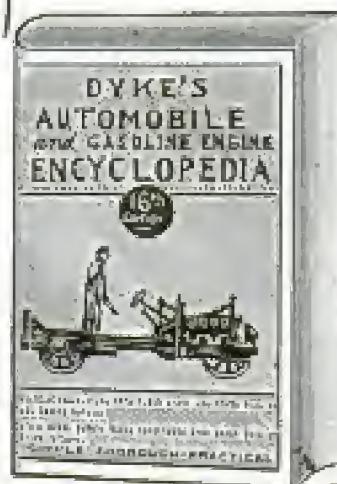
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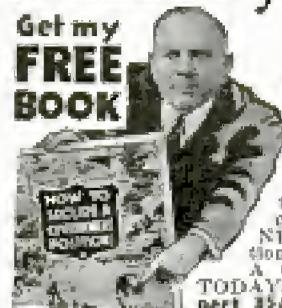
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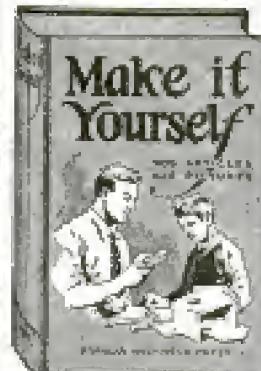
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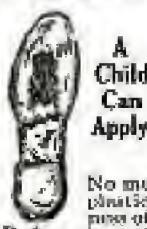
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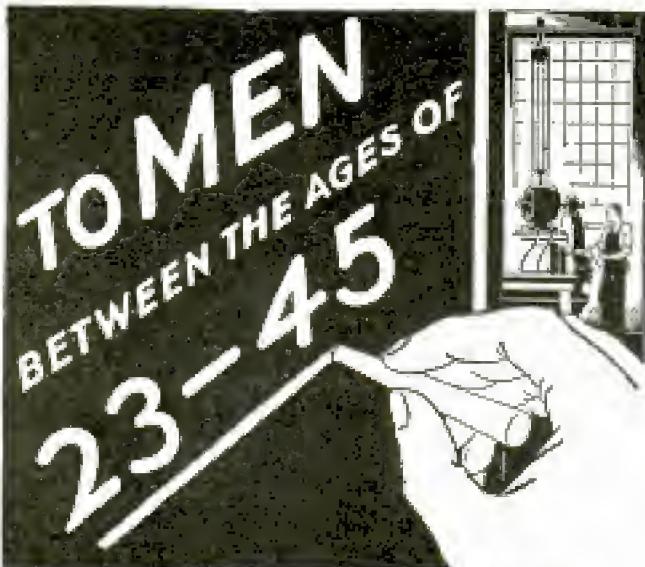
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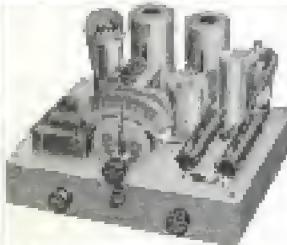


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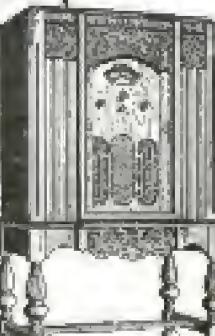
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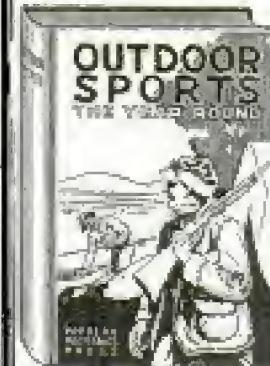
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MAKE Opportunity for few experienced circulation and advertising representatives in every locality to connect with a publishing corporation. Norden, Lothrop Building, Detroit, Mich.

OPERATE Chain of vending and amusement machines. Be independent for life. Start small, grow big. P. Gaudet, 1826 East Main Street, Rochester, N. Y.

INCORPORATE Hardware preparatory mining invention business. Retail personnel control. Booklet, forms free. Universal Corporators, Dyer, Ind.

OPPORTUNITIES, unusual, interesting, profitable. Particulars free. Economy Sales Co., Manchester, Iowa.

CHARTISTS: Delaware; best, cheapest; free forms. Colonial Charter Co., Wilmington, Del.

EARN Large income with "chain" of semi-automatic-gum reading machines. Start small capital. Particulars free. Publishing Corp., DeKalb and Broadwater, Brookline, N. Y.

WANTED Reliable men or women for indoor work. Puffett Enterprises, Douglas, Wash.

PROPHORN Machines \$15 up. Money making. Northdale Co., 2113 Hardin, Des Moines, Iowa.

MAIL Order business fascinating and profitable. Many earn thousands yearly. Begin small. No canvassing, nor personal contact. Inside relatives from 30 years experience. Send quarter for book, also batch of small order information. R. Breanice, 217 S. 21st, Philadelphia.

WHOLESALE Directors 300,000 articles per. Other valuable information, Moran Company, Warehouse, Massachusetts.

A BUSINESS of your own making—Sparkling Glass Name and Number plates. Checkbooks, etc. Big book and sample free. E. Palmer, 540, Webster, Ohio.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1050 W. Broad, Cleveland, Va.

FIFTY Successful mail-order propositions. Address, K. Hume, 2819 Metropolitan, Chicago.

AMATEUR Cartoonists: Sell your work. Write Smith's Service, P.W.L.D., Wethersfield, Wash.

SELL By mail. Books, novelties, bargains. Large profits. Particulars free. B. Eddy, 525 S. Dearborn, Chicago.

100 MONEY Making opportunities. Wolfe Frimson, 4007 Rare Ave., Chicago.

ARTIFICIAL Marble sanitary tiling. Instructions covering wood or cement flooring $\frac{1}{2}$ inch thick, fireproof, all colors, low cost. Ornamental casting, concrete plaster paper-marble decorations, garden furniture, statuary. Flexible molds, particular and illustrations free. Chris. Maher, Elmont, N. Y.

BIG Money at home plating auto parts, reflectors, mirrors, chandeliers; by new method; experience unnecessary. On this furnished. Gunmetal Co., Ave. N., Decatur, Ill.

MAKE Artificial marble, colorful glassy tiles, no polishing; rather unbreakable. Novelties, lightboards, bookends, doors, whitewires, Hard, Inexpensive, fireproof, enamel wash. Secret cement methods. Amazing samples. Dr. John A. Payne, 915 Grande Vista Drive, Los Angeles, Calif.

NEW Mail-order opportunity. Excellent profits. Address Roland System, Wareham, Mass.

OUTDOOR Sports for everyone—Enjoy them all year round with aid of book published by Popular Mechanics. This valuable encyclopedia not only furnishes hundreds of ideas for new and popular sports for every season of the year, but also gives complete instruction for making the necessary equipment at very small cost. \$50 pages and 450 illustrations. Send today as book is full of thrills and excitement. For winter sports enthusiasts. Mailed postpaid anywhere for \$2, or will be sent C. O. D. to any address in U. S. Simply pay postman when delivered. Popular Mechanics Press, Room 802, 200 East Ontario St., Chicago, Ill.

CHEMISTRY

CHEMISTRY Students' outfit and chemicals for sale. Illustrated catalogue and story of boy chemist who became the world's greatest inventor. Mr. Large experiment book for junior chemists, 10c. Descriptive pamphlet from J. H. Winn Mfg. Co., 2135 Broadway, New York City.

TEN Cents brings latest book containing 160 fascinating chemical experiments and kit catalog. Kenikit Corporation, 133 Johnson Street, Brooklyn, N. Y.

HANDBOOK For chemical experiments. Illustrated. Mr. Experiment booklet 15c. Chemical catalogues Mr. General Chemical Co., Reading, Pa.

JOURNAL The American Amateur Chemist Society, 10,000 word journal and periodicals 10c. 223-36 North Raymond, Lansing, Mich.

CATALOG Listing 2,500 illustrations chemicals supplies. 3,000 chemical, 1,000 scientific books sent for 50c. Laboratory Materials Company, 643 E. 51st St., Chicago, Ill.

FORMULAS AND TRADE SECRETS

MINERALS Recyclizing, electro-plating,忘失 formulas. Portable electro-alkal water made for \$1.00. Guaranteed. Custer, 83 Leslie, Highland Park, Mich.

ARTIFICIAL Marble. Formula 50c. Any formula 50c. Catalog free. T. Huffman, Room 106, 1518 Wilson, Chicago.

MAKE Pure polish. Bush solder, Savo-X-Salt, radiator caps. C-Clean Plate. Stain-out, rug cleaner—these formulas \$1.00 each; free \$4.00. Mr. List free! Rapid Service, Edwardsburg, Mich.

SUPERIOR Formulas—for real business building products. Skilled advice. Expert analysis. Atlantic Research Laboratory, 15th East, Cleveland.

BEAUTY Formulas: 10 to make complete the finest French cosmetics \$2.00. Chantal Laboratories, 324 W. 73rd St., New York City.

2000 MONEY-MAKING Formulas. \$1.00. Catalog free. Valley, 233 W. 114th, New York.

ARTIFICIAL Rubber, formula 50c. Materials \$2. Bayardhill Engineering Co., Box 91, Bayardhill, Mass.

FREE Formulas catalog. latest money making. Western Chemical, Balboa, Oregon.

SUCCEED With your own products. Make-sell them yourself. Formulas, processes, trade-secrets, analytical service. Catalog free. B. Thury Co., Washington, D. C.

SUCCESS Is sure with Miller's guaranteed formulas; best science can provide for making popular, biggest-selling goods. All lines. Don't buy formulas till you've received my latest literature. Miller, Chemist, 1394-H, Tampa, Fla.

TESTED Formulas. Newest—guaranteed. Catalog free. Gelnstead, Chemist, Edwardsburg, Mich.

500 FORMULAS And big illustrated catalog 25c. Ideal Book Shop, Park Ridge, Ill.

FORMULAS: Beverages, flavors, extracts and other processes. Free Information. Formula Company, 9th Ave. and Broad, Seattle, Wash.

GUARANTEED Formulas, recipes, processes. Expert analysis. Catalogue free. Industrial Institute, Dept. 204, 360 N. Michigan, Chicago.

500 VALUABLE Formulas 25c; circular free. Harry Teitel, Doctor, Ind.

FREE Catalogue, formulas, analysis. Herbst, Chemist, 206 Prospect, Grand Rapids, Mich.

FORMULAS—Our literature will surprise you. Bellotti, 4932 N. Kester, Chicago.

FORMULAS All kinds. Catalog free. Clover Laboratories, C.P., Park Ridge, Ill.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1050 W. Broad, Cleveland, Va.

15,000 PROFIT Making formulas, following and many others: Acidants and emulsifiers, agriculture, alloys and amalgams, artist's materials, beverages, cements, glues, pastes, mortars, bleaching, coloring, coloring metals, dyeing glass, heat treatment of metals, household formulas, ice cream, confectionery, chewing gum, laboratory work, exterminating vermin, lubricants, paints, varnishes, photographs, condiments, canning formulas, rubber, soap, candles, soldering, paint preparations, perfumes, waterproofing, fireproofing, writing materials. Just write for "Scientific American Encyclopedia of Formulas." When postman hands you book for \$5.00 and postal charges. Popular Mechanics Press, Room 802, 200 E. Ontario St., Chicago, Ill.

LATEST Imported formulas, \$1.00 each. List free. Persian Laboratories, Bay City, Mich.

10,000 MONEY-MAKING FORMULAS. Tells you how to make and sell almost everything under the sun; cosmetics, soaps, anti-freeze solutions, battery solutions, beer-form, cheap, chewing gum, cleaning preparations, extracts, hair preparations, India, bieling, leather polish, mirrors, perfume, polishes, typewriter ribbons, carbon paper, washing powders, liquid soap, and hundreds of other profitable articles. Send no money. Just write a postcard for "Hawley's 20th Century Book of Formulas." Pay postman postage and \$1. Popular Mechanics Press, 200 E. Ontario St., Room 802, Chicago.

AGENTS WANTED

MAKE Big money selling the "Lisco" electric water heater. Amazing two minute demonstration makes quick sales. Details \$1.00. You profit up to \$2.00 each sale. Prospects everywhere. We guarantee success. You risk nothing. Write quick for full details and free sample offer. J. H. Lichten & Co., Manufacturers, Dept. P., Lancaster, Kentucky.

ADUING Pencil, Adds mechanically; new invention; sells like wildfire; agents wanted everywhere; get sample now. Add-O-Graph Co., Dept. 27, Salt Lake City, Utah.

FACTORY Representatives applying authorized service stations. "Prestex-Elec" new Digital insulation, like them. Protects cars, trucks against rain, bad weather. Prestex-Elec Co., Dept. 5E, Peoria, Illinois.

MEN'S—Women, 8% to 10% daily. Selling 25¢ household universally that repeats. Three in ten sold in every house. Free sample. Write Poco Company, Dept. B-211, 3007 Pine St., St. Louis, Mo.

DOES'T Shake wet. Has Shot ever else. Wizards starts car without shaking; saves gas, oil. Delivers 10,000 units. 10.00% seller. Pays for self immediately. Wizards sold online. Wizard Mfg., Dept. S-102, Peoria, Ill.

100% PROFIT in the Everlasting Matrix. No heat or friction. What makes it light? No wind can blow it out. Details see. Sample and sales plan 25c. New Method Co., Dept. PM-3, Bradford, Pa.

\$10,000 ARTICLES Wholesaler. 300 sellers directory 25c. Arts, H-1601-21. Delivery, 300%. PROFIT Selling now. 20-10-1. Kitchen utensil. Retail 25c. Costs you \$1.00 a dozen. Sample 15c. New Method Co., Dept. PM-3, Bradford, Pa.

NEW, Peacocke—Bell auto stop mats. Quality rubber with owner's name marked white. Details free. Peacocke Products, Dept. B-40, 805 Main, Akron, Ohio.

EAST As pie to sell Christy's polishing cloth. Works like magic. Everywhere buys. Big profits. Free sample. White Christy, 6757 Lakewood, Newark, New York.

NEW Flower-Shark cutter, every home needs. Sells for 25c, worth more. Agents make 300%. Sample 25c. K & Manufacturing Co., 448 N. Vermont, Los Angeles, Calif.

HEIKS A new way to make from \$25 to \$100 a week building permanent hairdressing business for yourself. It's new, different, becoming a rage. Write quick! Hairdressing, 3819-B Drake Ave., Chicago, Ill.

"SOMETHING Different"—Smart new felt rug. Sample \$1.00 postpaid. Garland Mills, Chelsea, Mass.

IT'S New. Washes clothes smoothly clean without rubbing. Every woman buys. 200% profit. Retail 25c. Big repeater. Sample free. Atlas, Cheshirefield Station, Dept. M-5, Cheshire.

SCIENTIFICALLY Designed Mazda lamps eliminate glare, double light. Retail \$1.50. Sample set \$1.00. Specify automobile. Beaumont, New Haven, Connecticut.

DUEKET Very pocket size cigarette holder. Newest and greatest little invention for holding cigarettes. Agent's commission 200%. Leonard Sales Company, Toledo, Ohio.

AUTOPAX—New complete record book for automobile owners. Every motorist prefers. Retail \$1.00—Saves motorists hundreds. Sells on sight. Autopax, 318-K West Washington, Chicago.

REPRESENTATIVES Throughout United States. Attractive compensation. Write to Dart Laboratories, 20-B West 6th Street, New York.

ORIENTAL Line. Big sales. Big profits. Big repeat orders. International Laboratories, Inc., Knoxville, Tennessee.

WAVO-LITE, New automobile waving stop signal. Flashes like railway signal. Two rear stop lights alternate when foot brake applied. Absolutely new. Representatives wanted. Inquire White Mfg. Co., Peoria, Ill.

AGENTS Wanted—Brite-Edge-Brighter. Wonderful road light, no glare. Universal reflector. "Best headlight device on market." Low price, fast seller. Exclusive territory. Send 50¢ sample pair and agency details. L. M. Ward Co., Inc., M-26, Waukesha, Wis.

AGENTS—Our combination needle threader and sewing needles. Wonderful seller. Particulars. Miller Co., 540 East 175 St., Bronx, New York.

PROFITABLE Home business. Legitimate. No canvassing. Maynard Publishers, P-928 Broadway, New York.

ENGRAVED Nameplates, signs, numbers, initial, desk, city nameplates. Big profits. Milton Specialty, 90 Stewart, Providence, R. I.

REPRESENTATIVES Wanted. Automatic glass blade sharpener. Fifty cents. Safety Products, Arrow Ave., Cleveland, Ohio.

MEN'S Women, district managers—Sterling chemical soap and polishes sell everywhere. Steady repeat, 100% profit. \$2.00 an hour easy. Sterling, 45 Main, Rockford, Illinois.

AT last, scratch eraser that heals scratches on steel furniture. Rubs easily—scratch disappears. Sells on demonstration. 100% profit. Agents freely appointed. White, Prentiss, 616 San Joaquin, Denver, Colo.

MEXICAN Hand made feather pictures. Most attractive, beautiful, attractive. Novelty work. Great margin of profit. Send 25 cents for \$1.00 worth sample and details. Mexican Art, Apartado 1203, Mexico City, Mexico.

300% PROFIT Selling mystery gas lighter. Retail 25c. Costs you \$1.00 dozen. Sample 10c. Square Deal 202c. Dept. P-91-31, Indianapolis, Ind.

STRANGE Insulating cord. Prevents shorting. Saves electricity. Admired, public, snazzy. Approved by Gen'l Housekeeping. Tel. telephone also. 140% profit. Samples furnished. Newark, Dept. S-4, 4000 Harrison, Chicago.

SEWING Needles, 30 packages. 11.00. Russian, 2210 Blackrock, New York.

DISTRIBUTOR—"Dragon-Fly" trash-proof 25¢ flying model airplanes, selling all merchants, premium users, etc. Very large discounts. No competition. Executive Bureau, \$100,000 opportunity even in depression year. Western Aircraft, 1105 W. 7th, Los Angeles.

ELECTRIC Gas Heater runs on and heats gas water heaters by switch upstairs. Great convenience. Fully guaranteed. 37.00 commission. Precision Machine Co., Indianapolis, Ind.

AGENTS—Wall lighting standards to easily assemble at home. Cooper Electric Co., Park Ridge, N. J.

CLEAN Up. Household article sells on sight. 100% sales guaranteed on trial orders. Sample free. Topsy Co., Somerville, N. J.

AGENTS—Earn 50% comm. on a line of necessities. Also premiums to create interest in your customers. Colonial Chemical Co., 2124 Carson St., Pittsburgh, Pa.

200% Sensational mouth freshener! Largest, strongest 25¢ pad ever made—sells over \$5.00. Your profit \$1.00—Easy! Blended 10c. 1-2550 N. Ashland, Chicago.

100% Metal self-threading needles, size 3/8, bind people thread them, sample packet and particulars 10c. Agents wanted. Win. Celeste, Yandalia, Ill.

Genuine Gold letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 488-18 North Clark, Chicago.

EVERYBODY Needs food! I'll start you with a regular weekly route supplying famous "Carol" products to steady customers. Route pay \$2.00 weekly up. Pay begins immediately. Write Alice M-105, Route M-2, 1011 Monmouth, Cincinnati, O.

100% PROFIT Gold and colored sign letters for store windows, offices, trucks, signs. Numerical letters. Complete. Easily applied. Permanent business. Neatline, Akron, Ohio.

GUARANTEED "Iron-Duct" hosiery. Men's latest fancy hose—doz., \$1.25-\$1.50; ladies' fashioned hosiery—doz. \$1.50-\$2.00. Catching fire. Superior Hosiery Company, Dept. 34, New Haven, Conn.

SELL GoodYear tires—\$2.00 up. GoodYear Balloons, 18 West End, New York.

NEW Changeable sign sells to stores for \$1.00, agent's profit 300%. Particulars free. National Sign System, St. Louis, Mo.

100% PROFIT. New liquid metal. Melts anything. Solders. Waterproof. Guaranteed formula. 50c. R. Brooks, B-27M, Arkansas, Wis.

QUICK TRICK automobile car cleaner and polishing cloth. Clean and polished in one simple operation. Ther repeat. Walter S. Doe & Co., Kent, Ohio.

BIG Profits selling groceries, motor oils, paints, stock minerals. Sample case free. Martin & Bourne, 1612-B So. State, Chicago.

ELECTRIC Water heater—Now. Heats water instantly. Pocket size—retails \$3.75. Two minute demonstration makes you \$1.00 profit. Lux-Vac, Dept. 57, Elkhart, Ind.

WANTED Start with car to demonstrate and do service work for large Ohio manufacturer. Earnings \$50 to \$75 weekly. Farnier Co., Dept. 5, Dayton, Ohio.

CASH Paid for butterflies, insects. See Sinclair Display Advertising on page 12.

NEW Discovery. Washer clothes without rubbing. Whirlwind action. Great repeater. Splendid profit. Sample free. Besco, 4313 Irving Park, Chicago.

MAKE-Sell these guaranteed, specialty-needed: Plastic wood; insecticidal insect spray; chlorine; hand soaps; Silver water paint; lacquering blankets; Pure mesh tablet; Magic dish wash Water-Way floor solution; Plastic Composition liquid marble; using Miller's ferment formulas. Easy to start anywhere. Investment small, profits immediate and great. Mr. Leaven Miller, Chemist, Tampa, Fla.

MINIATURE Restored at home. Costs mere 5 cents per square foot; you charge 75 cents. Portable business plating, autoware, refrigerators, tableware, stores, refinishing, metalware, etc. Ourselves furnished. Details free. White, Sprinkle, Plater, 128 Marion, Ind.

MARYELL'S Chemical soap, chrome, polishes all metals instantly without liquid, paste, powder; record-breaking seller to businesses, stores; 100% profit; sample free. Sher. D. Mfg. Co., Union City, N. J.

FREE Booklet describes money-making opportunities, new ideas, original plans, money-making secrets and other valuable information. None require peddling or outlets. Elite Co., 114 Grand St., New York.

MAKE-Sell your own products. Formula catalog free. "Kemco," BW, Parkridge, Illinois.

SUCCESS With your own products. Make-sell them yourself. Formulas, processes, trade-secrets. Analytical service. Catalog free. B. Thaxt. Co., Washington, D. C.

EASY Money, applying gold initials on automobiles. Self-adhesive sign letters; anyone can apply. Agents, building money. Free samples. Write quick. "Halo," X-1043 Washington, Boston, Mass.

100% PROFIT Gold and colored sign letters for store windows, offices, trucks, signs. Monogram letters. Embossed. Easily applied. Permanent business. Neonite, Akron, Ohio.

MAN, Ladies, students—Sell license, part or full time. No competition. Profit 100-300%. Free samples. White, Oriental Importer, 511 N. 47th St., Chicago.

MAKE Prepare yourself. Newest tested formula. Catalog free. Chemist Ginstead, Edgewater, Illinois.

BIG Money steady. High grade coveralls, shirts, pants, shorts, shirts. Advertising on back. Best sellers. Great demand. Prospects everywhere. Free catalog. Strong Mfg. Company, 911 West Jackson, Chicago.

AGENTS For business, original powdered handsoaps. Approved Good Housekeeping. Everybody custom. Fine opportunity for business. Sample free. Solar Products, J-2144 So. 7th, Chicago.

AGENTS—Make \$5 to \$10 or more a day by buying auto lights to end glass and double road light. New development; converts headlights into non-glaring headlights; searchlights in 5 minutes without wiring or change of bulbs. Won't wear out. Amazing speed. Amazing performer. Write quick for money-making proposition. Z-Hay Co., A-66 Haleysville, Kansas 113x, Mo.

NEW Improved Electric Water Heater. Heats water instantly. Sells fast—\$3.00. Pocket size. Bestever, 4317P Irving Park, Chicago.

100 GILLETTE Type blades—\$1.00. Application-J, 1218 Broad, New York.

BIG Money selling shirts, ties, underwear, dresses, hostess, raincoats, coveralls, pants, belts, playuits. Sales \$10 free. Natural Co., Dept. 8, 1922-28 Lincoln Ave., Chicago.

THINLY Formulas produce perfect products. All sizes. Catalog free. B. Thaxt. Co., Washington, D. C.

\$10 KAHLN \$26 Weekly. Presto sharpener cuts keen edge on dull scissos. Quick demonstration sells it. Day's supply carried in your pocket. Sells 25c. Cost \$1.20 dozen. Gross \$10. Williams Corp., 32 Williams Hdg., Montclair, N. J.

FIRE Results of money-making opportunities, new ideas, original plans, money-making secrets and other valuable information. None require peddling or outlets. Elite Co., 214 Grand St., New York.

SELL Blouses, motions, norellies, toilettries. Our sensational prices challenge world. Free catalogue. Mills Sales Co., 901 Broadway, New York, or 75 South Wells Street, Chicago.

40% PROFIT selling signs used everywhere. Largest selection, wonderful repeat business, \$1.00 worth samples. 2c; 50 signs \$1.00; 100 signs, \$1.00. P. Franklin Co., 3822 Third Ave., N. Y.

EVEN Poor people must keep clean. Brushes, brooms, mops sold by the millions. Sell them in your own name. 100 per cent profit. Write for proposition. Wire-Grip Sanitary Brush Corp., 41 E. 11th St., New York.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950 W Broad, Richmond, Va.

"PICKEDUP SUIT" America's best hand cleaner sells fast to everybody. Removes grease, stains, ground-in dirt. Big profits. Sample free. Adams Manufacturing Co., Dept. A, Miami, Iowa.

BIG Profit bursting our genuine gold leaf sign letters on store windows. Experience unnecessary. Samples. Consolidated, 69-T West VanBuren, Chicago.

SELL Extra money at home. No canvassing. Hertzel, 802 Garden, Hartford, Conn.

A BUSINESS OF YOUR OWN—Making sparkling glass vases and number plates, checkerboard signs. Big book and sample free. E. Palmer, 312, Worcester, Ohio.

AGENTS—Clear invention! Inkspen makes every pen a fountain pen. Post office seller; big profit, demand increasing everywhere. Exclusive territory offered. Sample free. H. Marx Company, Tribune Bldg., New York, N. Y.

AGENTS Everywhere making money with our line of kitchen specialties, demanded in all homes. Big earnings possible. Write today for details. P. Seed Filter Co., 353 Broadway, New York.

PHOTO Medallion men and women, the largest line of photo novelties in the world. Lowest prices, quickest service. Send for catalog showing over 200 money makers. Gibson Photo Jewelry Co., Inc., 822-827 Grandview Ave., Brooklyn, N. Y.

WANTED You like to make \$10 to \$100 a day selling our line of toilet preparations? We want agents in every town men, women, students; whole or part time. Write for free sample outfit offer. Illinois Perfume Co., 515 E. 43rd St., Chicago, Ill.

MAN In each town to place auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers; by new method. No capital or experience required. Simple plan of manufacturing at home starts you in big money-making business. Outfit furnished. Free particulars and proofs. Gen Metal Co., Ave. H, Decatur, Ill.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950 W Broad, Richmond, Va.

100% Money and fast sales. Every owner buys gold initials for his auto. You charge \$1.50; make \$1.45. Ten orders daily easy. Write for particulars and free samples. American Monogram Co., Dept. 40, East Orange, N. J.

AGENTS: Stamping names on pocket-knife picturefruits. Sample check with your name and address. 25c. Stamping outfit. Emboss checks, check-books, name plates. Hart Mfg. Co., Dept. 2, 302 Degraw St., Brooklyn, N. Y.

REPLATE Brass wear-off automobile parts, reflectors, bath room fixtures, wash stands, forks, etc., with pure silver. Looks like new. Use U-Kan-Plate Polish. Positively no mercury; \$1.00 half pint. Postpaid. Satisfaction guaranteed. Agents wanted. Dept. A, U-Kan-Plate Co., Philadelphia.

SOMETHING! The business man. A signed guarantee to save money and time in cooking. No competition. 400% profit. No license required. Station C, Box 25E, San Diego, Calif.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950 W Broad, Richmond, Va.

AGENTS—Decorative name plates, signs, number plates etc. easily sold with large profits. Hertzel, 802 Garden, Hartford, Conn.

CALIFORNIA Perfumed Soaps, selling like hot cakes. Agents earning money. Catalog free. Mission Factory, P. O. 2325 W First, Los Angeles, Calif.

WE start you without a dollar. Soaps, extracts, perfumes, toilet goods. Experience unnecessary. Carnation Co., 611, St. Louis, Mo.

SELL Men's neckwear—wonderful proportion. Active-M, 20 East 28th, N. Y.

FLAVORING Extracts—Bottle yourself! Labels furnished. 60% profit! Whichever money-makers! Requests! Free offer. Thomas Manufacturing Company, Indianapolis, Ind.

HIGH-GRADE SALESMEN WANTED

SUCCESS For the hustler guaranteed, selling Vino Sano Grape Beets, Wine Bricks, Orange Bricks. Each brick equals one gallon juice, retailing \$1.25 each, also having 100% profit and more. Sold all flavors: port, sherry, burgundy, champagne, orange, lemon, etc. Take orders, give service, build a route. Prospects: Every bank, hospital, physician, restaurant, barbers, auto-camp, grocer, druggist, soft drink soda fountain, etc. Award initiations handling certain districts. Vino Sano written up all over nation, 10 years in existence. Legality twice established in Federal courts. Apply: Vino Sano Co., Dept. S-201, San Francisco, Calif.

DON'T Be a job hunter—start your own city business on our capital; no hard times, no lay-offs, your own boss; hundreds average \$5,000 annual sales year after year; we supply stock, equipment on credit; some 250 items necessary; selling experience unnecessary; wonderful opportunity to own pleasant, dignified, profitable business backed by \$17,000,000 world-wide industry; for complete information write Ruschleigh Co., Dept. E-11-3333, Prospect, Ill.

SALESMEN—Four \$15.00 sales to stores net you \$30.00 daily. Savers Systems, Est. 1945, 2801-2811 Sheffield Ave., Chicago, Ill.

FLAVORED Extract sensation. \$1.00 vanilla, \$1.00 lemon, \$1.00 almond, \$1.00 maple, \$2.20 value in attractive sample case. Write your profit. Every house uses. Sales case. Fromo Folks, 84, Paul, Minn.

BUSINESS Stationery, largest line, highest quality. Quickest delivery. Biggest commissions. Bonuses. Free counter-cut-outs. Experience unnecessary. Outfit free. W. J. Jones, 2330 Ogden, Dept. 543, Chicago.

EXPERIENCED Salesmen. Wonderful opportunity selling full line accident and health policies. Sell easy. Liberal commissions. Twenty-four-year-old legal reserve company. Write for special offer. Inter-State Insurance Auto's Accident Co., Dept. 18, Des Moines, Iowa.

APlenty New and different—Fast selling &c and the merchandise on attractive counter cards. 100% com. for you and dealers. Advertised by radio. No investment required. Catalog free. (Publ. 1921.) Werlin's Products, 200 Central, Spencer, Ind.

SALESMEN-DISTRIBUTORS. New auto tire patch; guaranteed 10,000 miles. Repairs blowouts permanently. Sells garages, gas stations, tire shops. Salesmen's profit 100%. Up to 200% to dealers. Easy sellers. Exclusive territory. Economy Rubber, 644 Burkhardt, Dayton, Ohio.

\$18 TO \$25 Daily; biggest selling line of men's suits. Meets present day conditions. Starting sales at \$11.50, \$14.50, \$16.50, \$18.50. Also, raincoats, alehers, lapels and boy's suits. Biggest commission paid in advance. Liberal bonus. Free outfit. State age and selling experience. "Jim" Foster, Inc., Dept. 23, 2220 South Euclid-Ave., Chicago.

SALESMEN—At last! New feature auto pinheads everywhere. Dealers wild with joy—property back again. Profits enormous. Samples free. Puritan Novelty, 1407 Jackson Blvd., Chicago.

\$85.50 COMMISSION, 100% Business cards, three colors, only \$1.50, including genuine leather case. Outfit free. U. S. Business Card, 449 Canal Street, Dept. E-14, New York.

SALESMEN: New, different, improved business stationery \$2.45 thousand; cards and blotters \$1.50 thousand. Outfit free. New selling plan. Big commission. Promised delivery. Outfit free. Leader Economy, Dept. 22, 318 St. Hamilton, Chicago.

SELL No longer. Enormous earnings selling a merchant's popular, special union-made non-skid shoe. Gets big with garages, factories, delivery, U. R. men. Free sample. Hera-Tex, 20, Center, Rockford, Mass.

AGENTS: Salesmen Distributors! Thirty-Five America is waiting for our product. Absolutely legal. New! Different! Depression proof. Immediate earnings. Biggest money-repeat all year business. Clarotone Co., 600 N. Wells, Chicago.

GIVE Profits—it's \$170 weekly, \$500,000 published! Start amounts low no investment plan. Season starting, K&S, 4324 Belmont, Chicago.

125 DAILY Possible selling merchants printing, novelties, specialty items at half price. Quick delivery. Union label. 40% commissions advanced. Experienced management. Elizabeth outfit free. Northwestern, 821-L Jackson, Chicago.

SALESmen: Sell canvas gloves to retailers. Good side line. Samples free. Cleaver Bros., Carlisle, Ill.

GRIND Paying job open as local representative, old successful manufacturer selling direct to wearers. Sensational values pants, breeches, coats, collars, shorts, Largest line in field. Big tree with over 3,000 cash commissions. Outfit free. Langweir, Dept. 115, 149 Avenue St., New York.

MAKE \$10.00-\$22.00 Daily taking printing orders. Depression-proof. Easy work, full or part time. Merchants, professional men order on sight. Tremendous money printed necessities, lowest prices. Highest quality. Huge 128-page sales portfolio free! Dept. 226, Koenig-Bair, Cincinnati, Ohio.

FREE Order to our salesman. Sell personal stationery. Richard & Brendel Co., Fort Wayne, Indiana.

LARGEST Sales sensation of the year. Foster's famous food flavor deal. \$1.20 value (4 large bottles, vanilla, lemon, almond, orange). Extra fine quality, all for 99¢. over \$100. 50¢. Every housewife buys. Write (the originators) G. F. Foster Products, Dept. 22, St. Paul, Minn.

NEW-HOLDING Screw drivers! Not magnetic. Remove, insert screws. Factories, garages, carpenters, electricians, mechanics, radio owners buy. No competition. Miller, 2028 Waltham Blvd., Boston.

200 DAILY Newest trade booster featuring 112.50 electric lamp clock for \$2.00. Merchants guaranteed results or money refunded. Stimulators. Dept. 114, 4311 Randolph, Chicago.

MANUFACTURER Of shoes, established 28 years wants sales representatives. Big profits paid in advance. Guaranteed quality. Reduced prices. Line includes wearers apparel. Free outfit outfit. Write Mason Shoe Mfg. Co., Dept. 2-14, Chillicothe Falls, Wis.

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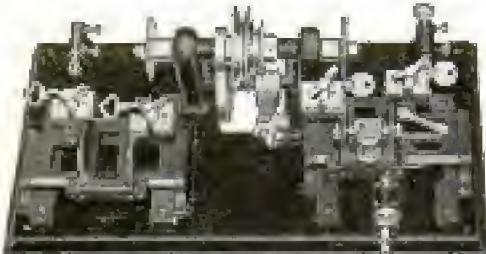
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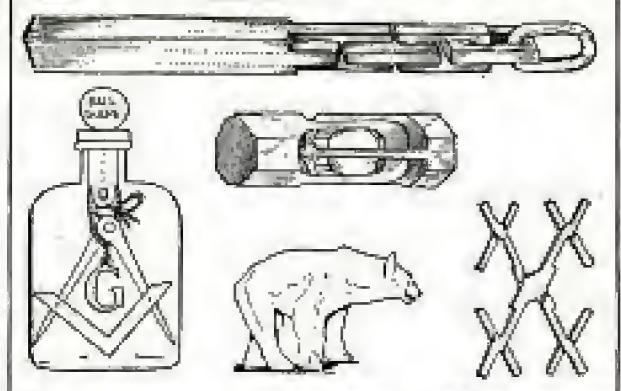
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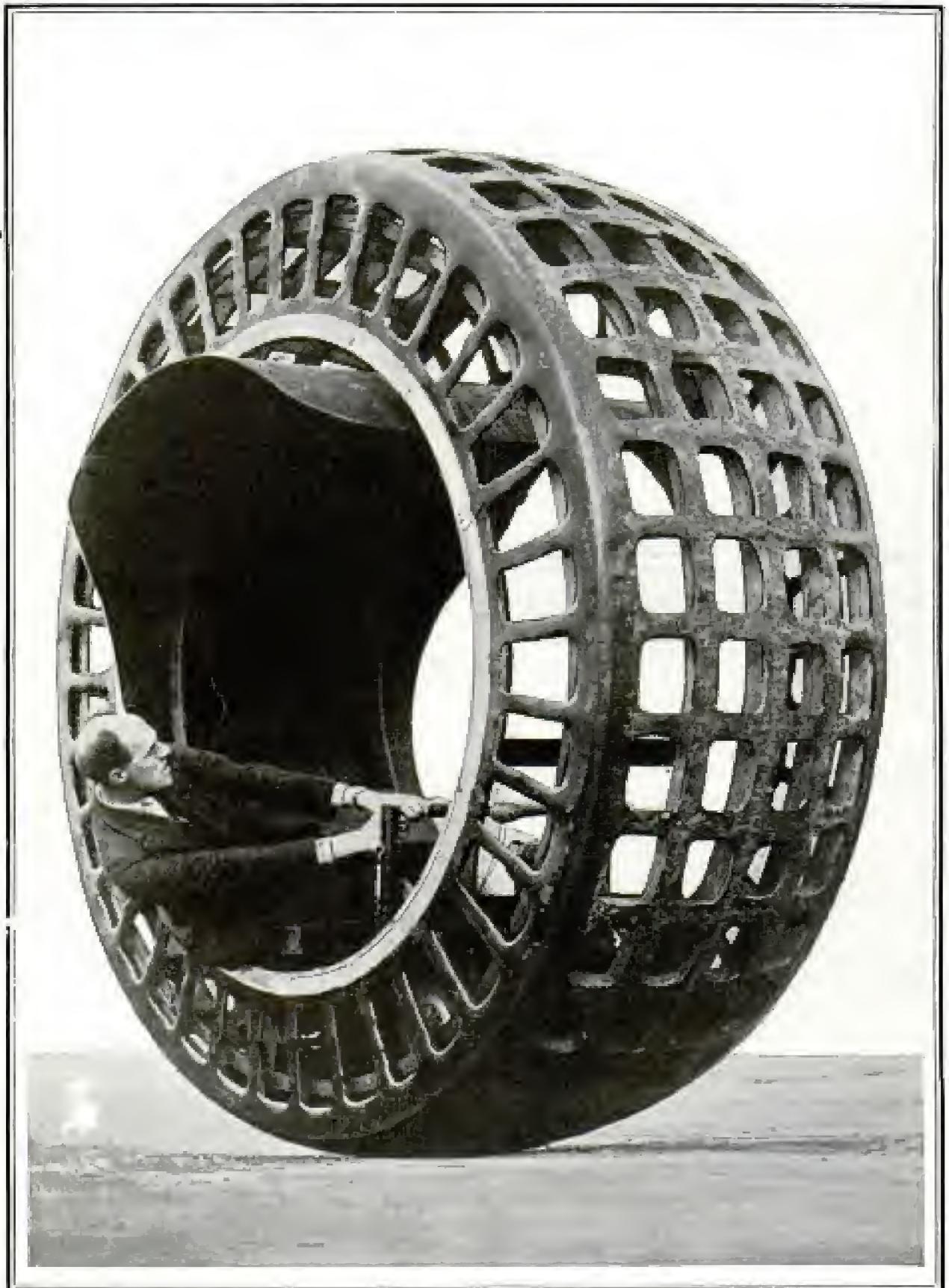
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Leaning Out of the "Dynasphere," a Vehicle Shaped Like a Big Auto Tire, in Making a Turn; the Motor Runs on a Track in the Cage, Revolving the One-Wheel Auto—See Page 752

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 57

MAY, 1932

No. 5



By
*Sir Malcolm
Campbell*

Holder of World's Land-Speed Record

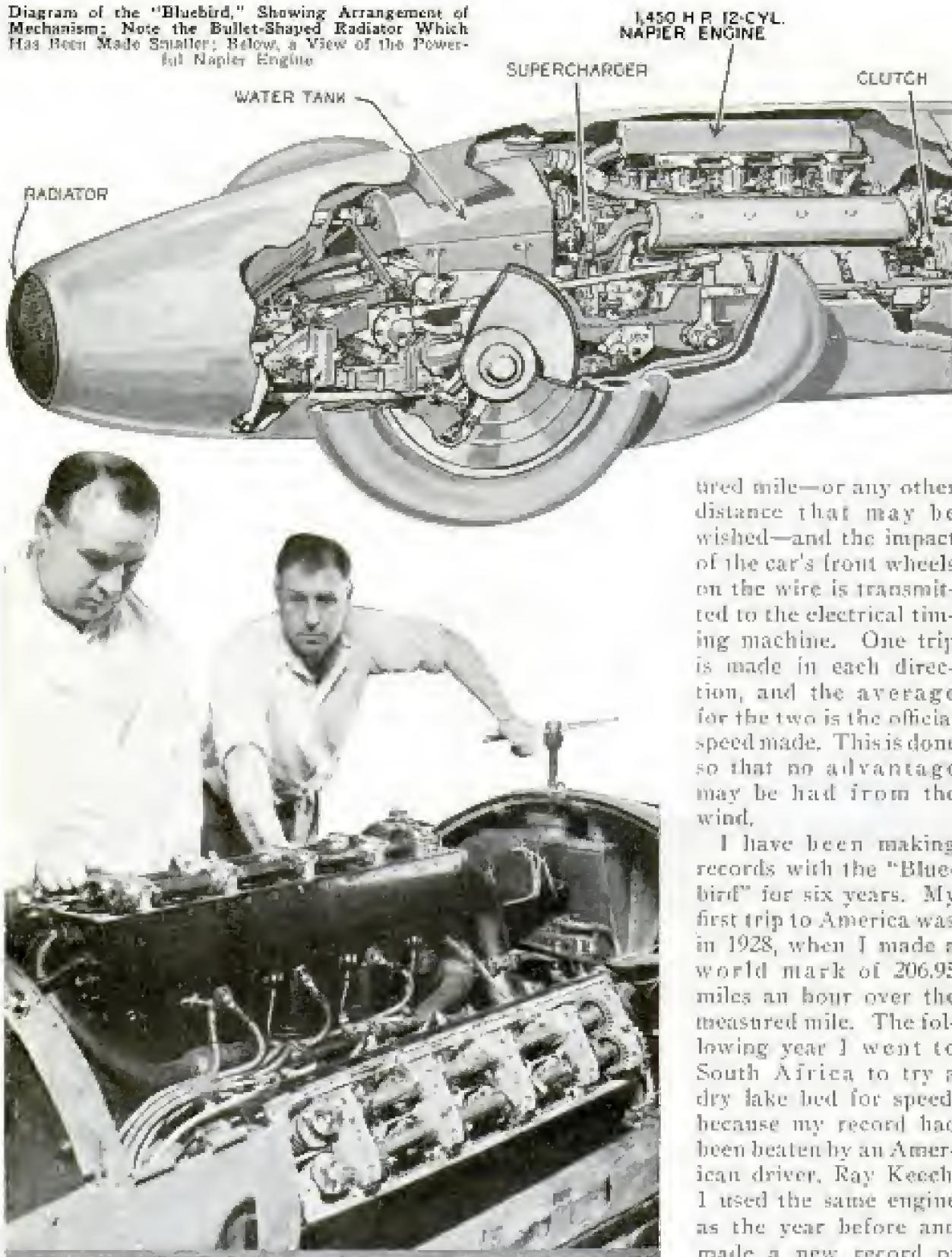
WORLD'S record speeds are decided by fractions of a second. Tuning a car for a world mark is therefore a battle against time. To win, you must have a combination of a perfect car, the right course and favorable weather. And I am going to add another requisite—luck, which always plays a large part in such undertakings. By luck I mean what Americans call having the "breaks."

Daytona Beach, Fla., is the only place I know where it is possible to make world's

Top, Sir Malcolm Campbell Ready to Start on His Dash for Record in the "Bluebird," Shown Below

Lesterine Studio 312 - 8 Palmetto Ave
Daytona Beach
25c

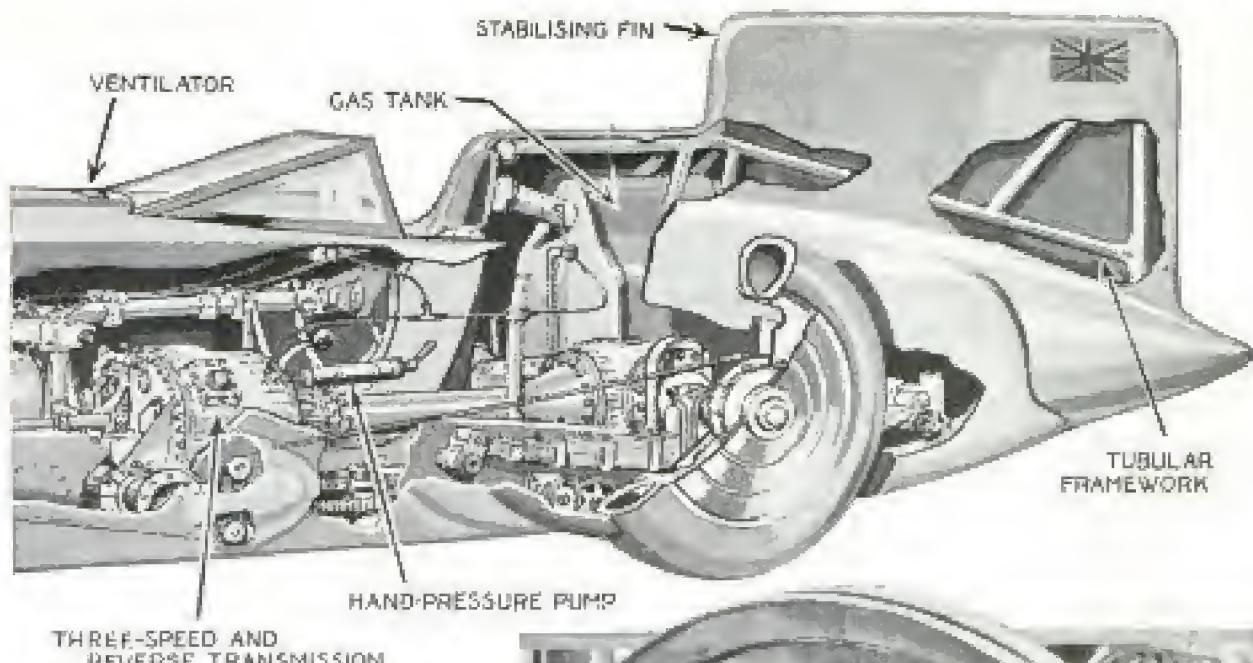
(Copy A)
 Diagram of the "Bluebird," Showing Arrangement of Mechanism; Note the Bullet-Shaped Radiator Which Has Been Made Smaller; Below, a View of the Powerful Napier Engine



land-speed records. The sand packs almost as hard as cement, and there is sufficient length to get up speed. The measured mile is set as near the center of the twelve-mile course as possible. There is a wire stretched at each end of the meas-

tured mile—or any other distance that may be wished—and the impact of the car's front wheels on the wire is transmitted to the electrical timing machine. One trip is made in each direction, and the average for the two is the official speed made. This is done so that no advantage may be had from the wind.

I have been making records with the "Bluebird" for six years. My first trip to America was in 1928, when I made a world mark of 206.95 miles an hour over the measured mile. The following year I went to South Africa to try a dry lake bed for speed, because my record had been beaten by an American driver, Ray Keech. I used the same engine as the year before and made a new record of 211.491 miles an hour for the five-mile and 216.045 for the five-kilometer. In 1931, I came to America again after the record, which in the meantime had been raised by my fellow-countryman, Major Segrave, to 231.626 miles an hour. I knew that my old car as she

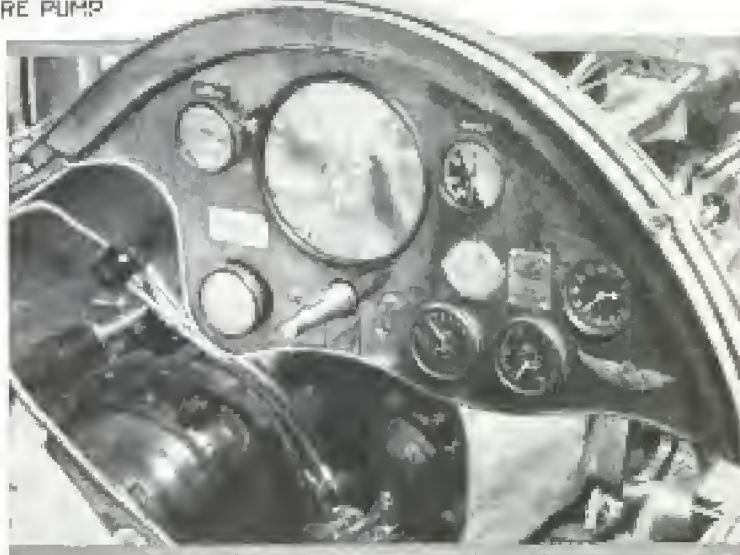


THREE-SPEED AND REVERSE TRANSMISSION

was could not hope to equal that record, so I installed a new engine of 1,450 horsepower with a supercharger. The frontal area was cut from seventeen to fifteen square feet by changing the body design. The driveshaft was placed to the left of the center of the car, and a larger stabilizing fin was built at the rear. This car did 245.733 miles an hour and a kilometer at 246.086 miles an hour at Daytona. Afterward I felt the "Bluebird" was good for a few miles more and we reduced the size and volume of the radiator somewhat and dropped the lines of the nose of the car. The result this year was the kilometer, 251.340 miles an hour, and the mile, 253.968 miles an hour.

The motor of the "Bluebird" is a twelve-cylinder supercharged Napier, with three banks of four cylinders each, the center bank vertical, the two outside banks at sixty degrees. There are four valves per cylinder, two inlet and two exhaust. The bore and stroke are five and one-half and five and one-eighth inches.

The single supercharger, of the centrifugal type, is mounted on the forward end of the engine and is gear-driven. The three carburetors, through which the mixture is drawn and not blown, are mounted around the supercharger casing. The terrific speed at which the supercharger runs



View of Instrument Board with Its Big Dials; a Red Light in Panel Flashes if Temperature Is Too High

is shown by the fact that a point on the rim of the rotor moves at approximately 960 miles an hour at full engine speed. Ignition is double with two magnetos, one for each set of plugs. The engine has a safe speed of approximately 3,700 revolutions a minute. At this speed each piston changes direction 7,400 times a minute. Gas consumption is approximately forty-five gallons an hour.

The "Bluebird" has no starter integral with the engine. Instead, a small twin two-stroke engine is used, one cylinder as a power unit and the other as a compressor. The magneto on this little engine furnishes the spark which is carried to the distributor on one magneto of the car. The compressor draws in a charge of carbureted air through a separate carburetor, the charge is compressed at eighty pounds

and sent over to the "Bluebird" through a half-inch hose. This compressed gas starts "revving" the large engine, which starts after two or three complete turns. Eight or ten minutes is required to warm the motor properly after the starter is disconnected. A small red light on the dash flashes to indicate a dangerous water temperature.

The tire sizes are thirty-five by six inches front and thirty-seven by six inches in the rear. The wheel track is four inches less in the rear than in the front, where it is sixty inches. The tires are of twelve-ply construction with a two-ply breaker strip. Each cord is the size of the lead in a normal pencil. The pressure is 120 pounds.

A car is only as fast as its tires will permit and only as good as its component parts. These tires served me for one complete round trip of the course, roughly about twenty-four miles. They are built to withstand a speed of 300 miles an hour and, to do this, they are all carcass—they have only enough rubber over the cords to make a smooth surface and keep dampness out. They revolve at a speed of 2,600 times a minute during a world's-record trial. This is a tremendous task for such large tires, and that is one reason their air pressure is so high—to prevent flexing due to the terrific centrifugal pressure occurring while they turn.

A record-speed car is the result of evolution. I do not say one could not be built without previous experience, but I do say that previous experience is a great help. It is my hope to be the first to drive an automobile 300 miles an hour. There is no question at all that someone is going to do it within the next five years or so. I have been asked scores of times what I consider the ultimate speed of the land vehicle. There is no limit to it. If one could drive sixty miles an hour a quarter of a century ago, what is to prevent someone ultimately driving 150 miles an hour? And if 150, why not 200? And if 200, why not 250? And thence onward to 275 and 300? I have actually reached a top speed for a time of 275 miles an hour in my present car. I can't see any problems of stability, of tires, nor of mechanical perfection that can't keep abreast of the increase in speed.

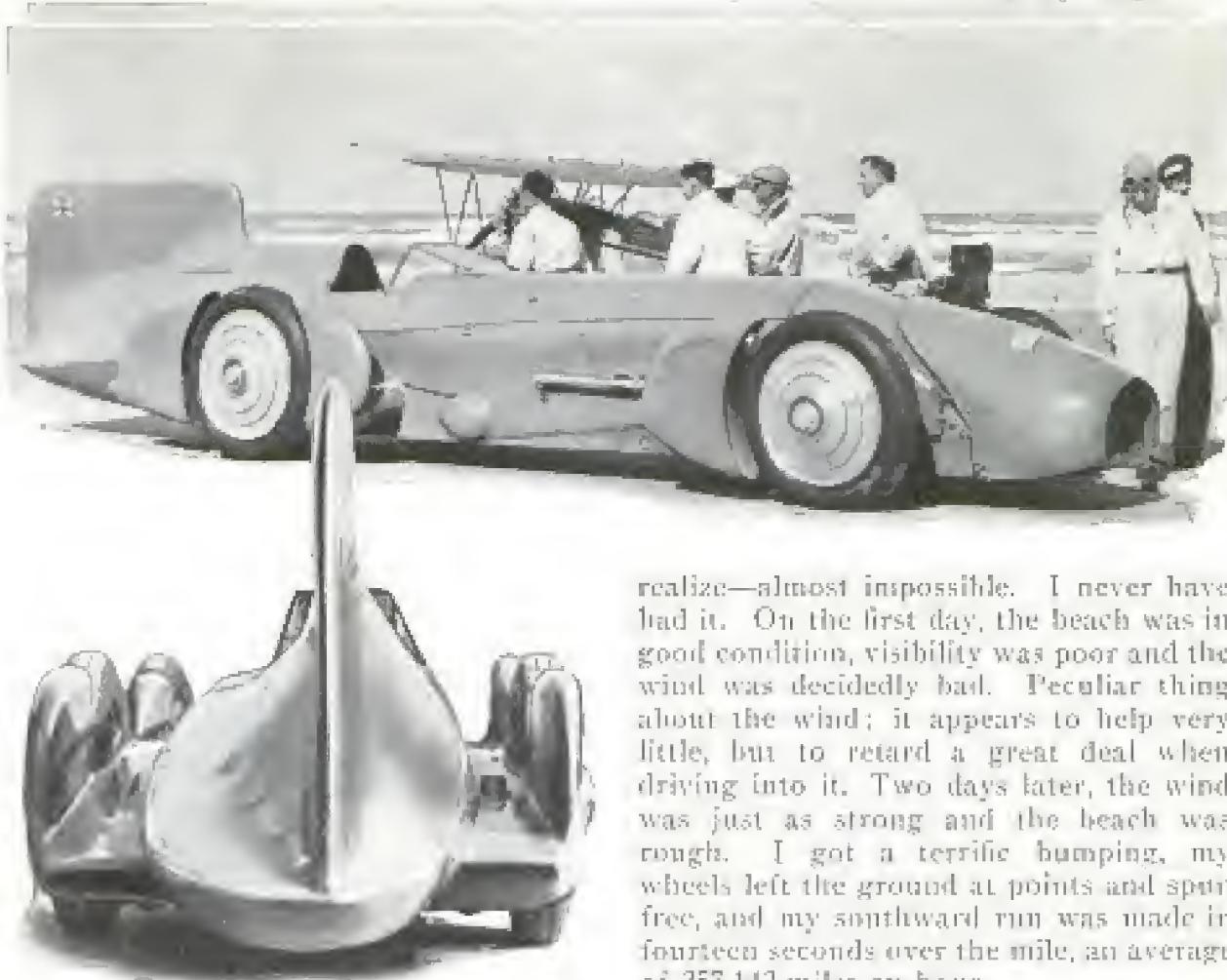
Body design is most important. As the speed increases, one must increase the horsepower or decrease the head resistance, or both, and at the same time design the body so that the car will maintain close contact with the ground. It is not enough merely to make a sloping nose and a sloping tail. It is not enough to figure that the downward pressure of the atmosphere will hold the nose of the car down, and that the sweep of the body to the rear will hold the rear end down so that traction may be obtained.

There is a delicacy of design required to accomplish this end, that cannot be clearly explained, since the theory of aerodynamics does not apply strictly to bodies moving on the ground. The car must not be heavy from pressure at either end—it must be balanced exactly, weight distribution must be correct.

This year I made five records, the longest of which was ten kilometers (6.2 miles). I did this on a twelve-mile course. This brings in a very fine point of acceleration and deceleration. One cannot guess at the distance required for these two—he must KNOW. If my car is traveling, say, 280 miles an hour, it is going to require approximately two miles for it to decelerate to 200 miles an hour. To decelerate from 200 to 100 miles an hour and on down to zero requires another two and a half to three miles. Here is an interesting acceleration table:

0 to 100 miles an hour	:	:	:	.3 miles
100 to 150	"	"	:	.6 miles
150 to 200	"	"	:	1.3 miles
200 to 250	"	"	:	1.5 miles
250 to 280	"	"	:	1.8 miles

Getting back to driving: Take the ten-kilometer distance on a twelve-mile course. Running southward at Daytona Beach, the ten-kilometer distance starts at approximately mile 3 and ends at mile 9. Obviously, since it takes the "Bluebird" between four and five miles to get up speed, I am not traveling at near top speed when I enter the ten-kilometer. Instead of going 260 miles an hour, I am traveling at approximately 230 miles an hour. My speed increases as I go. It may reach my top speed, and in order that I may be able to decelerate safely and come to a stop, I must back off the throttle while I am still in the ten-kilometer distance. In



Above, the "Bluebird" Just before the Start for the Record; Below, Tail Fin of the Racer

fact, I begin backing off a mile or so before I reach the end. This must be done gradually—to lift the foot entirely and instantly would mean disaster. I begin gradually and have not entirely released my pressure on the throttle pedal until I have gone a full mile. Even then I am traveling about 200 miles an hour. I leave the engine in gear, however, to get its braking effect. I do not use my brakes until my speed has been reduced to 100 or 125 miles an hour. They would not be of much use above that and would only be burnt up by applying them. By slowing up before the end of the ten-kilometer, I cheat myself of quite a bit of speed, but I make stopping safe. In the case of the kilometer and the mile, I enter them going practically at full speed and come out the same way.

To make a perfect record, one must have a perfect beach. In addition, visibility must be good and there should be no wind. This is a difficult combination to

realize—almost impossible. I never have had it. On the first day, the beach was in good condition, visibility was poor and the wind was decidedly bad. Peculiar thing about the wind; it appears to help very little, but to retard a great deal when driving into it. Two days later, the wind was just as strong and the beach was rough. I got a terrific bumping, my wheels left the ground at points and spun free, and my southward run was made in fourteen seconds over the mile, an average of 257.142 miles an hour.

MODERATE LIGHT FOUND BEST IN OBSERVING FINE DETAIL

B 526
Increase in the brightness of light will make objects stand out from one another with greater clearness up to a certain point, but after that, increased illumination merely makes them blur. Dr. W. W. Wilcox, of the University of Kansas, says that when two narrow bars are seen against a faintly lighted background, they appear much larger than their actual size. This would indicate and physically must be separated by a relatively large distance in order not to appear as one object. Increasing the light intensity has the effect of decreasing the apparent width of each bar and thus makes the interspace more easily observable. The apparent shift of the edges of the bars accounts for the change in visual acuteness. Doctor Wilcox thus disputes the theory previously held by some psychologists that change in light intensity calls into use a different number of elements in the retina of the eye.

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B 33
710

POPULAR MECHANICS



This Steel Tower, Equipped with Bullet-Proof Windows, Guards Entrance of Chicago Building

BULLET-PROOF TOWER GUARDS ENTRANCE OF BUILDING

Constructed of bullet-proof steel, a tower for guarding the entrance has been added to a Chicago building. An armed guard is always on duty there behind bullet-proof windows which permit a view in all directions. Below each window is a slot for shotguns and rifles. In the tower, which is topped by floodlights for illuminating the entrance, are many devices by which alarms can be sounded in various parts of the building, locks on doors can be set and elevator motors stopped.

"AURA" OBSERVED BY SPIRITIST AN OPTICAL ILLUSION

When the spiritist believes he sees a grayish aura around the white flesh of the human body, he really is deceived by an optical illusion. This is the conclusion of Prof. D. F. Fraser-Harris, physiologist and author, who says it is easy for anyone to observe such a phenomenon. To do this, it is only necessary to hold the outstretched fingers of your two hands touching one another at the level of the eyes about a foot in front of a black back-

before British Psychological Society. Reported in "Nature."

ground. Stare at the finger tips for about fifteen seconds, then draw them apart slowly. Where the tips met, you will then see black spaces which do not show up, however, because of the dark background. Between these are areas filled with what appears to be grayish mists. The cause of the illusion is what is known as a negative afterimage. If you stare fixedly at a bright-red object and then look at some neutral background, you are likely to see a patch of color about the size and shape of the red object. If your afterimage is positive, the color of the "shadow" will be red, but a negative afterimage in this case would be green.

GLIDER FLYING IS MADE EASIER BY ANGLE RECORDER

All angles assumed by the wings of a glider in flight are recorded for future study and improvement by a device developed by a member of the Washington, D. C., glider club. It looks like a model biplane suspended under the glider's wing. Through suitable linkage, the tiny plane records the angles assumed by the glider plane on a moving drum. All angles of attack between twenty degrees above and below horizontal are shown. It was found in a recent test that twelve degrees was the normal angle for take-off towing, while the wings held an angle between five and eight degrees in normal flight.



Angle Recorder on a Glider Shows All Fore-and-Aft Positions Assumed by Plane

clm. H. B. Hendrickson
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B-219 Dr. Louis Copinsky

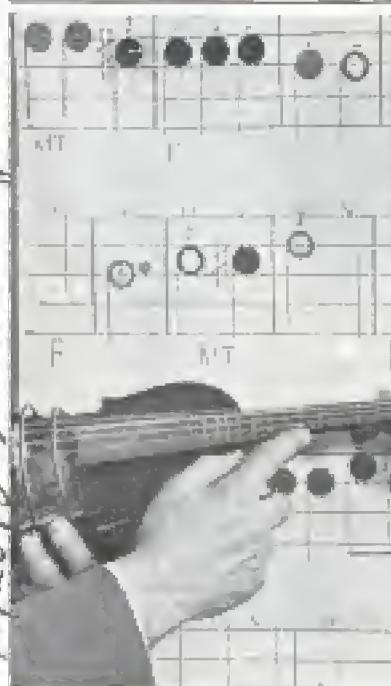
POPULAR MECHANICS

C. F.

Violin Taught in Half Hour by Aid of Color

Composed music system. 3275 Whitehouse

Simple melodies can be played on a violin or cello in half an hour, although the student may have had no previous musical training whatever, as the result of a new system of teaching developed in New York. Forty pupils of the system, ranging from five to eleven years old, gave



Colored Notes and Finger Positions; Small Children Learn Quickly, Top; Note Bow Guide and Strap, Right

a public recital recently after but a very short period of training. Colored notes and colored guides on the instruments are the basis of the new method. Each note has a different color on the music and several niches are cut into the fingerboards of the violins or cellos and colored to correspond. The four strings also are colored, while two metal guides across the bridge of the instrument keep the bow in the proper position. The fingers also are kept in correct posture on the violin neck by a wrist strap. It is not long before the position becomes natural with both hands without the aid of the guides. The string positions also become a part of the normal musical reflexes so that it is no longer



necessary for the pupil to "match" the colored note with the colored niche.

B-219

COTTON FOR INSULATION

Low-grade cotton has proved its value for insulation purposes. Treated with inexpensive chemicals, cotton can be made fire-resisting and moisture-proof. In addition, it can be placed in cases made of corrugated cardboard, beaverboard or tin.

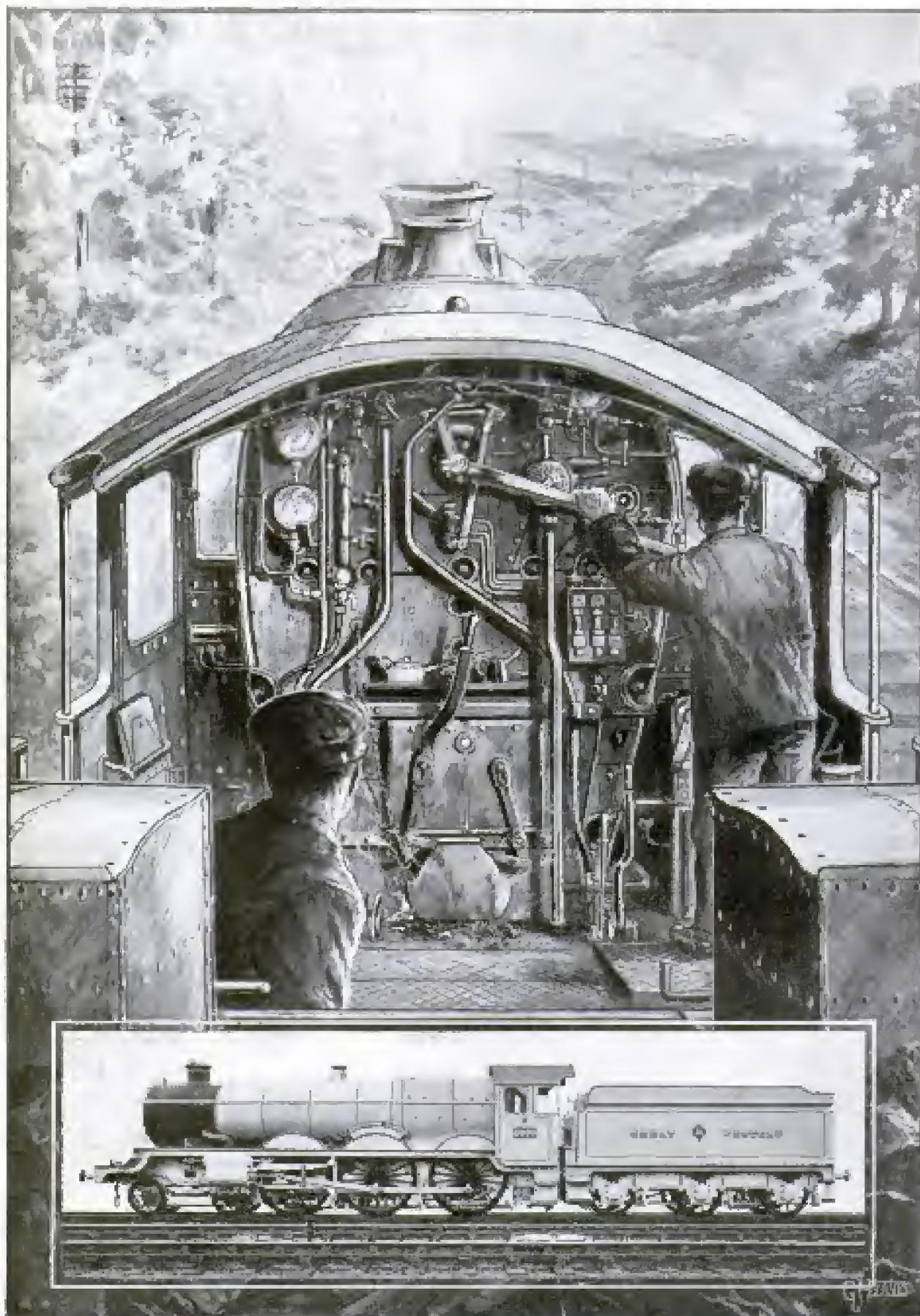
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In the Cab of the World's Fastest Rail Flyer



Bx 414

ENGLAND WINS THE RAIL SPEED RECORD FOR TRAINS

Although American trains have traveled at well over 100 miles an hour, such speed has been in spurts rather than at a sustained rate, and England today claims the fastest train in the world, basing its boast on the regular schedule maintained by the "Cheltenham Flyer" of the Great Western railway. This express travels between Cheltenham and Paddington, the London terminus of the road. The flyer makes four stops, but the run from Swindon to Paddington, a distance of about seventy-seven miles, is without a halt. On the first two runs the train's average speed was 79.9 miles an hour with a maximum of eighty-nine miles. This train now makes a regular schedule averaging about seventy miles an hour with a top speed of over eighty-five. The flyer usually carries seven coaches and the average weight of the train, including the engine and tender, is 347 tons. The locomotive used is of a type smaller than those employed for long-distance passenger hauls, but the engine has a very low center of gravity.



Race Horse Receiving Ultraviolet Light Treatment to Speed Up Spring-Training Process

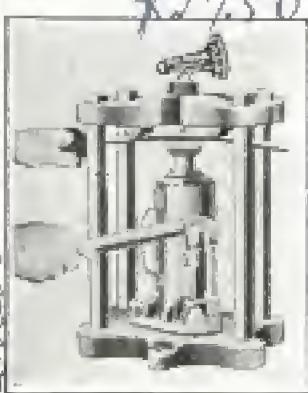
LIGHT BATH FOR RACE HORSES SPEEDS SPRING TRAINING

Ultraviolet-light baths have been introduced in at least one big racing stable, near Chicago, to speed up the conditioning of the valuable animals during the pre-spring period. The violet-ray treatment helps put the horses in the pink of condition in the winter long before the racing season opens, cutting down materially the training time during the spring.

AUTO SPRINGS ARCHED COLD IN ONE-MAN PRESS

Without applying heat or hammer to the automobile spring, it can be arched speedily and properly by one man with the aid of a hydraulic press recently developed. The spring leaf is placed against a head in the press and, as pressure is applied and the leaf bends upward, it acts on a pin which moves on a pointer and indicates the amount of arch being given the leaf. The hydraulic jack is removable, and the press will accommodate any standard make or size. After the first leaf of the spring has been treated, the arch on each successive

leaf is increased from a sixteenth to an eighth of an inch on the gauge, thus giving a uniform contour and clearance or tension between successive leaves.

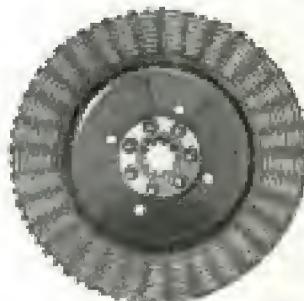


INTERWOVEN DISK FOR CLUTCH GIVES LONGER SERVICE

Interwoven with treated strands of pure asbestos rope, a single-plate clutch disk is being offered as a solution for auto-clutch trouble. It will last about as long as the vehicle, and has a velvetlike engagement without slipping, grabbing or chattering, its makers claim. Asbestos rope is interwoven

on the fingers of the steel clutch disk so that it becomes an integral part of the plate.

The disk is then treated in hydraulic presses and accurately machined. No rivets, copper wire or foreign strengthening material are used.

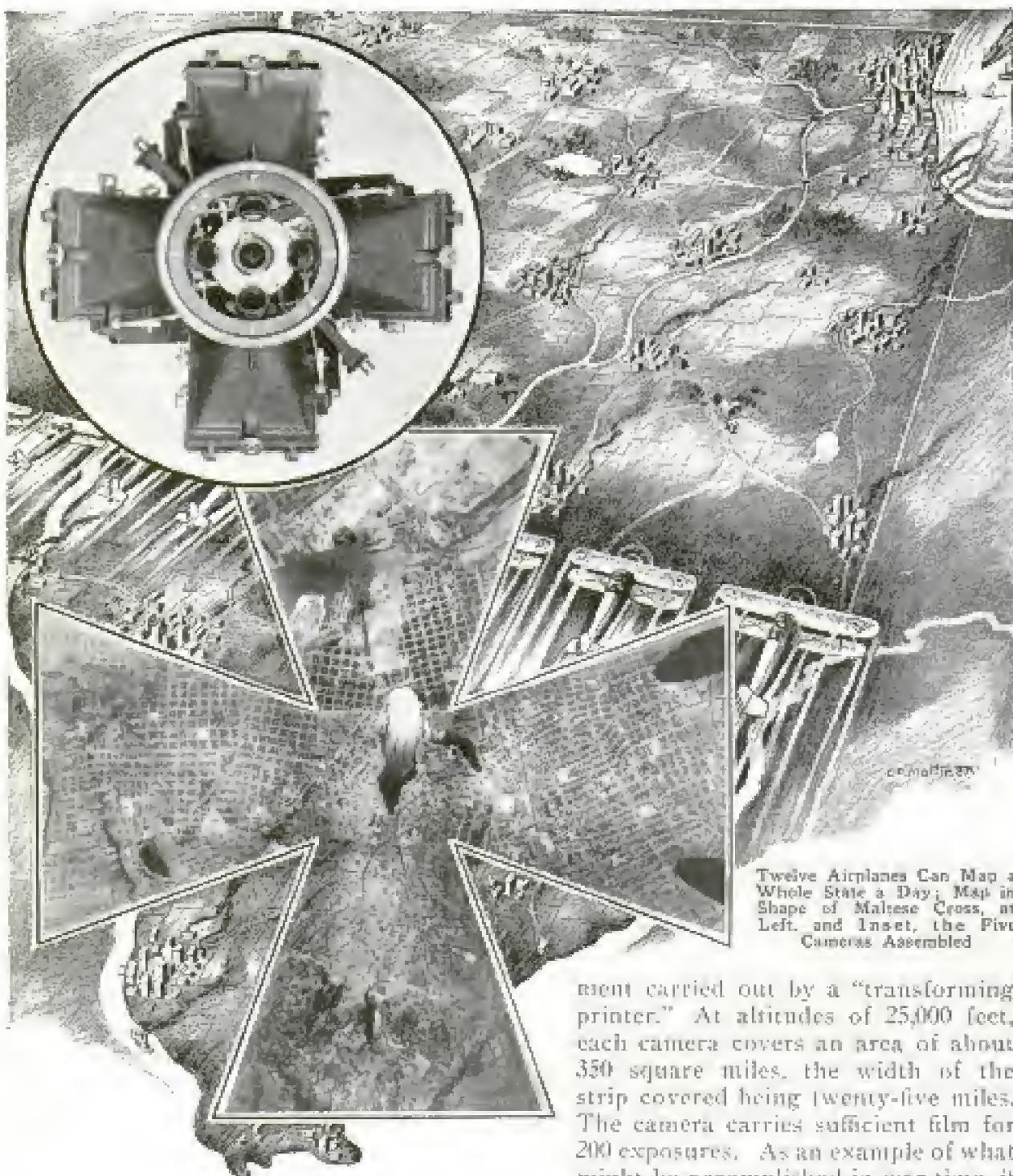


Blackwood of Spring, Vacaville, California
near Cheltenham

Bear Mfg. Co.
Rock Island, Ill.

John C. Head
162 1/2 162
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Five-Lens Camera to Map State in One Day



Twelve Airplanes Can Map a Whole State a Day; Map in Shape of Maltese Cross, at Left, and Inset, the Five Cameras Assembled

ment carried out by a "transforming printer." At altitudes of 25,000 feet, each camera covers an area of about 350 square miles, the width of the strip covered being twenty-five miles. The camera carries sufficient film for 200 exposures. As an example of what might be accomplished in war time, it is pointed out that twelve airplanes could photograph the entire state of Illinois, and develop and print the map in twenty-six hours or less.

SHATTER-PROOF NUMBERS

Commissioned to develop unbreakable annunciator fronts for an insane asylum, so the patients could not break the glass

After several years' experiments by army engineers and the air corps, a five-lens camera for aerial mapping has been developed. With the new apparatus, five separate cameras, accurately assembled, photograph at the same time five contiguous sections of the earth below. The completed picture is in the form of a Maltese cross as the result of perspective treat-

Holtzer-Cabot Electric Co
12 Popular Mechanics
Boston, Mass

715

B 30 7

Rider Is Shown Resting as the Kick-Bike Rolls Along; It Is Propelled by Foot.

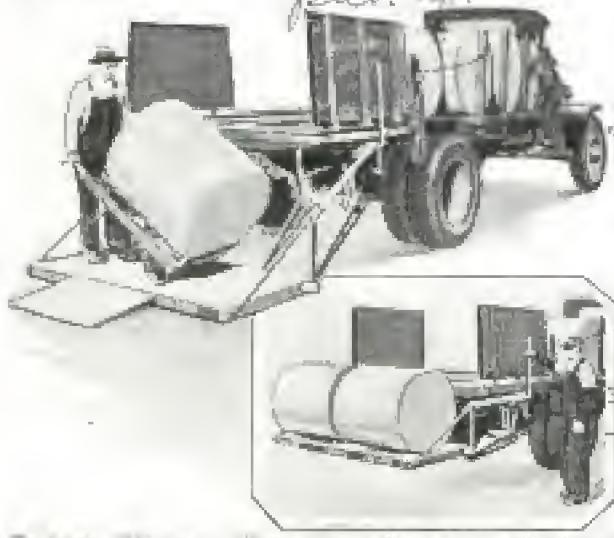
and use it as a weapon, an electrical-supply manufacturer has developed a new method that saves time, makes the boxes fireproof and the lettering more uniform. Previously, it was necessary to have a sign painter letter the numerals on glass which was then placed on the annunciator box to show which room was signaling. The new process photographs the sheet of numerals in their proper squares, the photo is developed in the normal way, is then dipped into acetate to make it sticky, and rolled flat upon a sheet of isinglass. The isinglass then is placed in the annunciator, making it at the same time unbreakable and fireproof.

TRUCK ENDGATE LIFTS HEAVY LOADS

B 348

With a lifting capacity of 2,500 pounds, a truck-body endgate has been developed that operates like an elevator and has proved a big time and labor saver in heavy loading work. A lighter model also is available with a lifting capacity of 1,500 pounds. The gate travels to the ground where it can be readily and easily loaded from a hand truck. The operator then sets the hydraulic action in motion and the endgate travels upward until flush with the body bed. After moving the load into the truck, the gate, by further application of hydraulic power, assumes its normal position, closing the rear of the body. The gate is particularly adapted to the handling of heavy barreled material, rolls of paper and similar commodities.

pat. ab.



Endgate Elevator Allows One Man to Load Heavy Rolls of Print Paper on Truck without Aid



BIKE PUSHED BY RIDER'S FOOT HAS RESTING PEDAL

Propelled by the rider's foot pushing on the ground, a "kick-bike" with a stationary resting pedal has been exhibited in Philadelphia. A knee rest is used instead of a seat. *at International Patent Exhibition*

RADIO CONQUERS SEA DEPTHS TO REACH SUBMARINES

A new triumph in wireless communication of vast importance to all the navies of the world, and which makes possible an immense increase in the future activity of submarines, has just been made by two French engineers. This is a triode tube of 150 kilowatts. After months of experimenting with this and a co-operating "pilot" tube, they have made possible the long sought-for transmission of wireless messages to a deeply immersed submarine. Contact between warships, airplanes and submarines is thus made possible. The preliminary experiments showed that salt water presented a screen to wireless waves, the deadening effect of which grew with every foot of depth. To break through this barrier it was found that waves of low frequency were required. As a result of experiments, the 150-kilowatt tube was built to send on a long wave of 10,000 meters.

Isaacson Iron Works

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B 389 *Praded Automotive Review Feb. 1932*

POPULAR MECHANICS

47 Pacific Blvd., Oakland, Calif.

Fooling Uncle Sam—Maybe!



Illustrations Showing Compartments Found in Autos by Government Agents for Carrying Aliens, Liquor or Narcotics

Bootleggers...

Dope Smugglers...

Slave Runners...

Uncle Sam's border agents and customs patrolmen match wits daily with smugglers attempting to cross the borders of this country in automobiles containing liquor, narcotics or aliens, but the clever ruse of the contraband carrier rarely escapes detection. This is because the federal men are trained to look for the unusual and are always suspicious of anything about a car that is out of the ordinary. The alert eyes of one agent noticed a white powder on the back of a car seat, and this clue led to the finding of a copper tank set in plaster of paris and filled with liquor in the upholstery of the seat back. A patch on a car roof aroused the curios-

ity of another inspector. An investigation showed a shallow steel tank, like a huge flask, built

B-234 Cmt Mrs Marion
Mekay Sea Cuff
L I New York

into the top of the car. It was filled and emptied through the hole in the top covered by the patch. Another smuggler devised a receptacle for narcotics in the steering column of his car, with an opening operated by an innocent-looking button on the dash. The button aroused the curiosity of the inspector because he knew other cars did not have such a fitting. Liquor, narcotics and diamonds occupy little space and concealment in a car is comparatively easy, but automobiles have been built to transport aliens as well. One such car had space enough for a person to hide along one side and around the back of the crumcase. Another was found carrying four aliens concealed in special compartments back of the front seat and under the car. Cars such as these are invariably seized because the fact that places of concealment have been built into them is considered evidence of professionalism. The amateur trying to sneak a bottle of contraband across the border may be fined and will lose his liquor, but the professional loses both contraband and car, and usually pays a fine or goes to jail in addition. Confiscation of cars usually is at the discretion of the officer making the seizure, although final decision is not vested in him. Such cars may be appropriated to government use, and otherwise are auctioned off to the highest bidder.

B-43-4
RUBBER VALVE ON PASTE TUBE CLOSES AUTOMATICALLY

Fitted with a rubber discharge valve which closes automatically, a collapsible tube for plastic compounds, such as toothpaste and shaving cream, is offered as a money saver for the industry. No screw cap is required.



*Ind. Noel
230 Park Av
New York*

SHIP FIGUREHEAD OF HERCULES BECOMES "WISHING IMAGE"



Taken from a Wrecked Ship, This Figurehead Has Become a Wishing Image for Girls

Adorning the roadside on Long Island, N. Y., a figurehead of Hercules from the U. S. S. "Ohio," which was built in 1820, has become a "wishing image" for girls of that section. The carved figure was salvaged from the wreck of the "Ohio" and stored in an inn. When the inn was destroyed by fire, it was saved and now stands beside Montauk highway. Beneath the image is a tablet which declares that if a maid kisses the god's cheek, she will "meet her fate within a week." If she climbs to the top and touches her lips to the forehead, the tablet promises her marriage within a year.

B-43-7
"WATERPROOF" BATHING SUITS

Bathing suits that dry almost as soon as the wearers leave the water are now being produced. They are made of wool and specially treated by a process which causes them to shed water, making the suits more comfortable when the bathers emerge from the pool.

*Eureka Knitting Co.
125-5th Ave
New York*



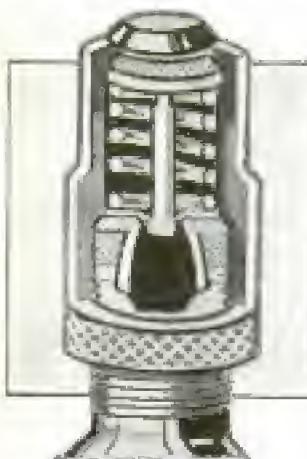
B-465 *Die Woche* 2/6/32
Portable Unit for Ventilating Manholes Connected to Flexible Air Hose Leading Below

MANHOLE VENTILATOR IS RUN BY ELECTRICITY

Fitted with an electric blower, a portable ventilator for pumping fresh air into manholes, underground vaults, shipholds, tanks and other confined spaces is now on the market. The motor which drives the blower operates on alternating or direct current. The outfit includes a flexible canvas tube leading the air from the blower into the space where it is needed.

AUTOMATIC CAP ON TIRE VALVE MAKES INFLATING EASY

B-466 Much time is saved inflating tires through the use of an automatic cap that displaces the old dust shell and valve-stem cover. The cap fits on the end of the valve stem and is sufficiently strong to keep out dust or water. Air readily forces the valve open in tire inflation, but through the use of two rubber-washer seats, the air cannot escape. The upper seat is capable of holding air in the tire even if the conventional valve core is missing. A pin projects down



Sterling Automatic Products Corp. 37 Franklin Buffalo, NY

from the upper part of the valve which opens the inner valve for pressure readings, when the common valve inside is used.

B-465 *Die Woche* 2/6/32

VITAMIN THAT CURES SCURVY MADE SYNTHETICALLY

Vitamin C, the anti-scorbutic property in citrus fruits, has been manufactured synthetically by a young scientist of Uppsala University, Sweden. He found that unripe lemons and oranges contained a substance in every way identical with narcotin, the active element in opium. In the ripening of the fruit the narcotin is naturally transformed into vitamin C, through the action of sunlight. The natural process can be accomplished by the direct irradiation of narcotin, thus obtaining the vitamin at any time or place where citrus fruit may not be available, in small bulk and in a form that will keep indefinitely and is subject to clinical variations in dosage as may be required.

B-329

ALUMINUM MILK-BOTTLE CAPS PREVENT CONTAMINATION

Tamper-proof milk-bottle caps of aluminum foil provide sanitary protection at comparatively low cost to many dairy customers. These caps cover the entire pouring lip of the bottle, being fitted snugly by an automatic capping machine which blanks the caps from a roll of foil, forms and embosses them, and attaches the finished product to the bottles. No inner seal is used as the capper presses the foil tightly over tiny beaded projections cast in the outer lip of the bottle. Twisting the covering draws the foil over these projections, smoothing out the indented edge, but not otherwise impairing the efficiency of the cap. It is impossible to tamper either with the bottle or with its contents without leaving evidence.



Aluminum Company of America Oliver Bldg Pittsburgh, Pa
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B. 423 dnd. R. H. Davis.

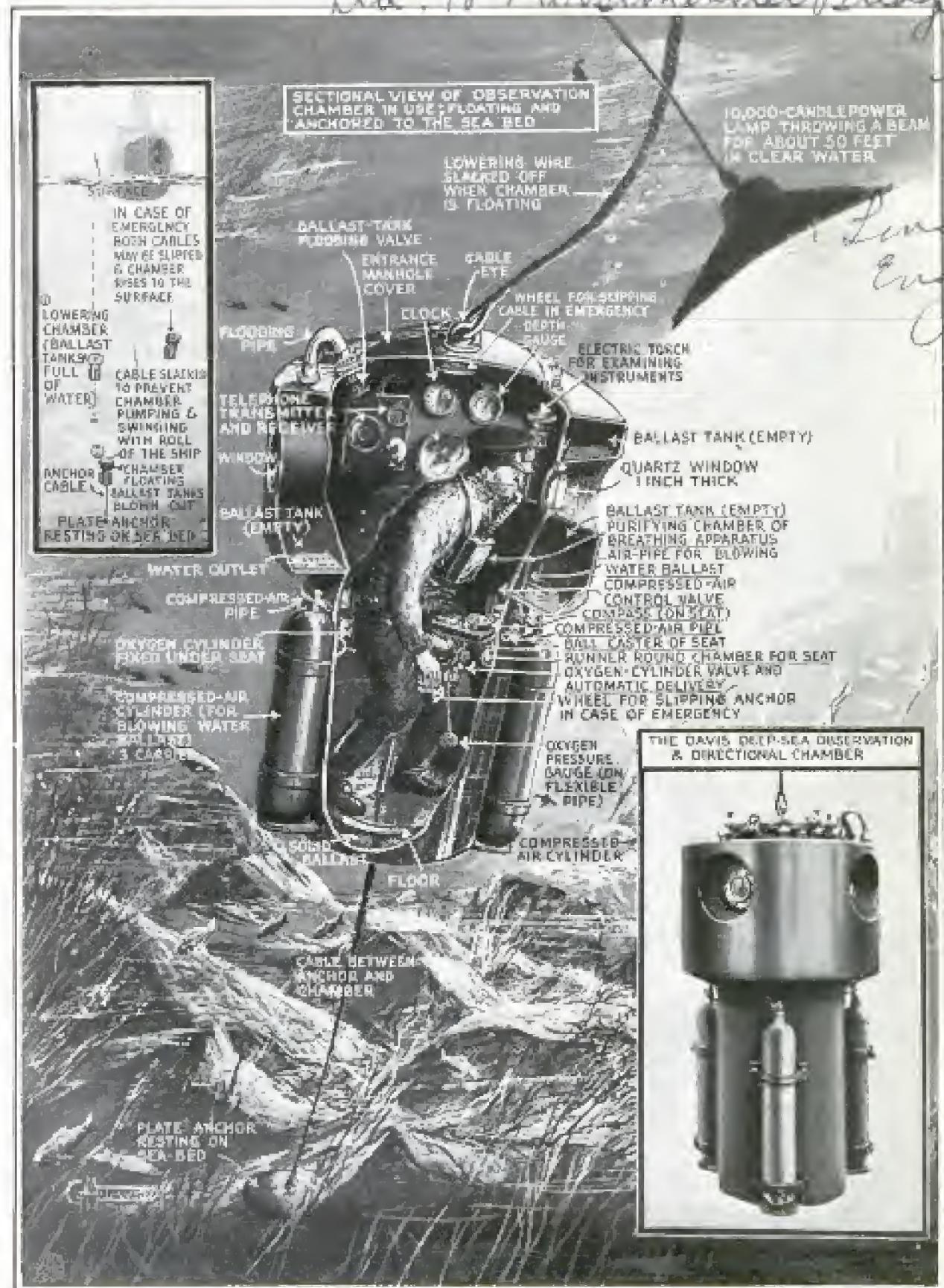
POPULAR MECHANICS
Developed by Lebeau Isomeric & Co

719

The Latest Means for Deep-Sea Explorations

Ltd. 181 Westminster Bridge Road,

J. E.



Courtesy The Illustrated London News

Submarine Observation Chamber Developed in England for Deep-Sea Work; It Can Be Anchored to Bottom and Relieved of Ballast so It Floats at End of Anchor Cable



Garden Cultivator That Is Run by a Small Motor Worn on the Back of the Operator

MOTOR CARRIED ON BACK RUNS HAND CULTIVATOR

Garden cultivators are being operated in Germany by means of a small motor strapped to the back of the operator. The motor develops one horsepower and can also be used for driving a wide variety of tools about the home.

HOUSE BUILT IN REFRIGERATOR FOR STUDY OF ATOMS

Designed as a nursery for atoms, a ten-room house in a refrigerator has been built at the Massachusetts Institute of Technology. It is known as the spectroscopic laboratory, and in it temperatures can be controlled with extraordinary precision to facilitate the study of light emitted by atoms. If all heat should be shut off in the building, with outside air at freezing, it is estimated it would take a month for the inside temperature to drop one degree. The building is a windowless concrete structure, entirely inclosed by the big refrigerator, the function of which

Cambridge, Mass

is to maintain a cool temperature on the outside walls. The refrigerator is a shell of brick, lined inside with eight inches of cork, and inside that, with twenty-four inches of concrete. The house is separated from the inside refrigerator wall by a six-inch air gap. One room is thirty-eight by forty-five feet, and another is thirty feet square. These are big spectrum laboratories where light is broken into colors. In the largest room, the colored beams are projected upon screens ranged in a half moon about the light source, resulting in an immensely magnified rainbow, so large that the meanings of its thousands of lines can be studied with accuracy. These lines represent the activities of atoms. The light is produced by the vibration of atoms and the spectrum is, in effect, a motion picture of what they are doing. It also reveals many facts concerning their properties.

B-45

BRUSH FOR CLEANING BOTTLES RUN BY WATER PRESSURE

Quickly attached to any hot-water tap, a brush bottle cleaner, operated by water pressure, spins at the rate of 800 revolutions a minute, thoroughly washing the inside of any bottle in a few seconds. The water that revolves the brush also flushes the inside of the bottle. The long spindle ends in a cylinder of tufted bristles which is forced into the bottle to be cleaned.

Brush for Cleaning the Inside of Bottles That Is Operated by Water Pressure

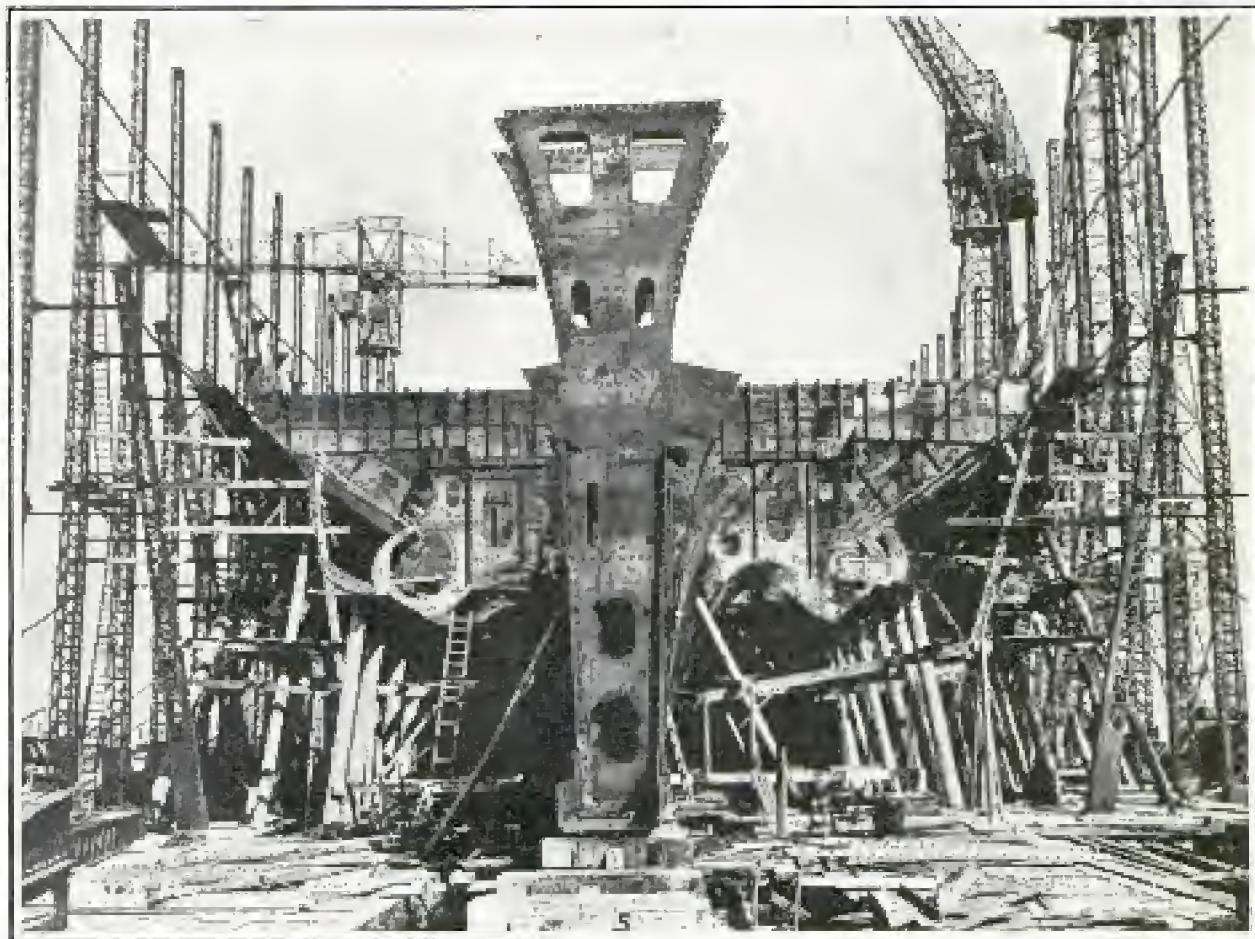


Eagle Engineering Co.
Springfield, Ohio
Dept. of Material

Dear Engelhardt, Berlin
Germany, Aug 11, 1931.

Chicago July 25/31

Frame of Huge Liner Takes Shape in France



Up-and-Under View of the Sternpost of the New French-Line Flagship "T-6"; Circular Holes on Either Side of the Central Post Are for Two of Four Mighty Propellers

Passage across the Atlantic in less than five days is promised in the new French line flagship, as yet unnamed, when she is launched in the fall of 1932. The vessel is now rapidly taking shape in St. Nazaire, at the Penhoet shipyards. She will be 1,020 feet long and will be driven by four giant propellers. Her power plant is to be a turbo-electric installation. She is the largest ocean liner now under construction, it is said.

B. 365

TORPEDO-SHAPED SAFETY ZONE DEFLECTS ONCOMING AUTOS

Torpedo-shaped safety zones for city traffic offer more protection to pedestrian and autoist, it has been found in tests at Kansas City. Cupped sides of the zone deflect oncoming autos, thus avoiding a head-on crash with the two-foot buttress at the end of the raised platform. Should the torpedo nose be struck head-on, the

car will be raised on its front axle, sliding the length of the nose and then striking the buttress. Red reflectors warn motorists of the zone.

FROZEN FOODS MADE VISIBLE BY DISPLAY CHEST

Purchasers of ice-cream "flowers," cakes, holiday molds, bars, packages and cups now can see what they are buying in its



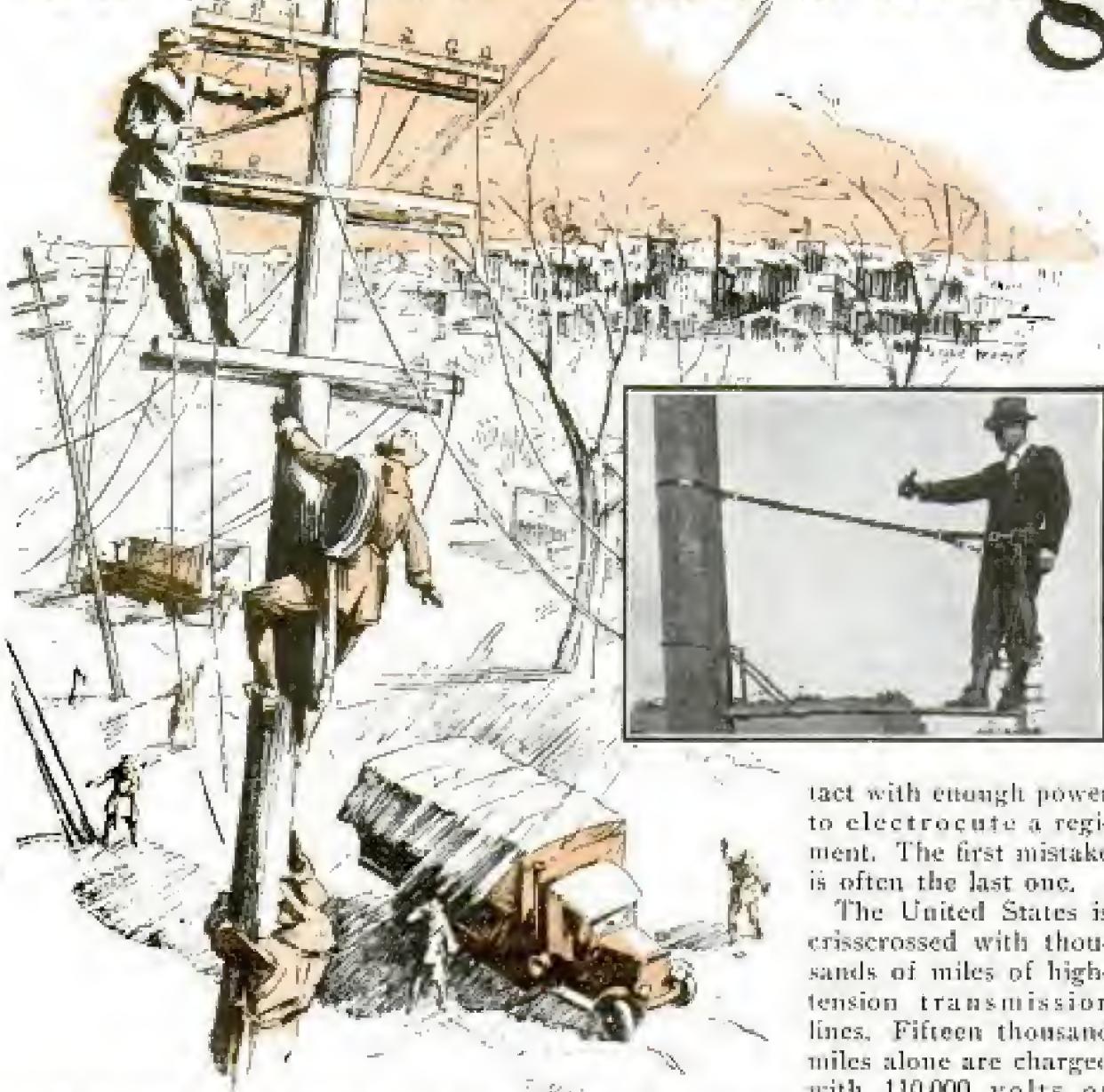
natural cool and fresh element, as a result of the introduction of a frozen-food chest for display counters. The chest has a glass front and is cooled by dry ice. It occupies little room, and its capacity is thirty pints of ice cream and about forty-eight bars.

Detroit Metal Specialty Co.
1651 Beard Rd
Detroit, Mich

Mo.
Manufacturer Record
2/11/02

03.11 Cont. Thos E. Stinson, Jr.
145 S Spring St
Los Angeles, Calif

Trouble Shooting



Snow and Sleet Storms Leave a Tangled Mass of Wires to Be Repaired; Inset, Lineman Demonstrating Safety Platform

If you see a wire trailing from a pole, spitting and twisting on the ground, stay away from it. Even if the wire is motionless, it may be charged with enough electricity to kill, so give it plenty of room. High-tension wires carry sudden death.

Not even the men who are trained to handle the "hot stuff" can be sure they will always escape. Death is always at the elbow of a lineman when he is perched on the crossarm of a pole. Wires just a few inches away carry thousands of volts. One slip of the foot can throw him in con-

tact with enough power to electrocute a regiment. The first mistake is often the last one.

The United States is crisscrossed with thousands of miles of high-tension transmission lines. Fifteen thousand miles alone are charged with 110,000 volts or more. Other lines high above the city streets

carry deadly circuits. Every inch of these lines is dangerous. The men who are entrusted with maintaining them must constantly be on their guard against the power they control. Electricity strikes instantly, out of a clear sky.

On one occasion, linemen were removing an unconnected dead wire from a string of poles that also carried live high-tension wires. The dead wire was being pulled from pole to pole by a reel mounted on a rubber-tired truck. Finally its end caught in a crossarm. "Pull her loose,"

on the "HIGH LINES"

shouted a lineman. The reel turned and the wire pulled free, but the strain on the line whipped the end up into wires carrying 66,000 volts. Instantly the line, the reel, the truck and a man leaning against the truck formed a short circuit to the ground. Three men were almost fatally burned, and the wire on the reel was fused into a solid mass of copper.

Another time when a crew was hauling down a dead wire, the same thing happened. But this time the men were pulling on a short rope attached to the line. They were calmly at work when suddenly a thick band of lightning from the wire poured into the ground at their feet. Their clothes were singed, but no other damage was done.

Modern safety devices for linemen have done much to reduce the hazard of their calling, according to E. C. Taylor, veteran power man. But the wires they juggle at the tops of the poles are treacherous. Unexpected circumstances sometimes overcome ordinary precautions.

"Linemen usually work in pairs on live wires," says Mr. Taylor. "One man makes the repair and the other assists and stands ready to help in an emergency. Both wear rubber gloves. Many men have been saved by a word of warning from their companions."

"Sections of the hot wires near by are usually covered with split lengths of rubber hose or other insulation to protect



Top, Linemen on Safety Platforms at Work among Wires; Below, Pulling Down High-Tension Wire with Rope Lead, an Operation Requiring Considerable Skill

the men if they should lean or fall against the wires. This precaution proved its value when linemen were making a routine connection to a wire carrying 4,000 volts. The pole was at a railroad crossing, and while the men were at work, a locomotive and a truck collided on the tracks. The engine plunged from the rails and crashed into the pole, nearly breaking it off at the base. The men on the crossarm, suspended by their safety belts,



Above, a Crew Raising a "Hot" Line into Position While It Is Charged with 60,000 Volts



were hurled against the high-tension wires, but the rubber hose saved them from harm.

Linemen and trouble shooters both get thorough physical examinations before they are employed. And they are trained to use the proper safety equipment out of respect to the current. Once a youngster was about to make a connection to a live wire without wearing his rubber gloves.

It was a high-tension wire, but the current wasn't strong enough to kill. He thought he could do the job and escape with only a light shock, but got hung up on the wire and couldn't let go. The other man took his time about pulling him loose, to make sure he had learned his lesson thoroughly.

"Whenever possible a ground chain is thrown over a high-tension wire before the men go to work on it," said Mr. Taylor. "Under ordinary circumstances the switches are pulled and the line is dead before the work starts. But the ground chain is direct assurance to the men that they can work in safety. If the current is thrown on accidentally before they are through, the chain will divert most of the electricity from them."

"When it isn't practical to kill the line, the men sometimes carry rubber blankets to sit or stand upon. They may use safety platforms that hinge out from the poles to let them work at the crossarm ends. But men who have work to do on the top of

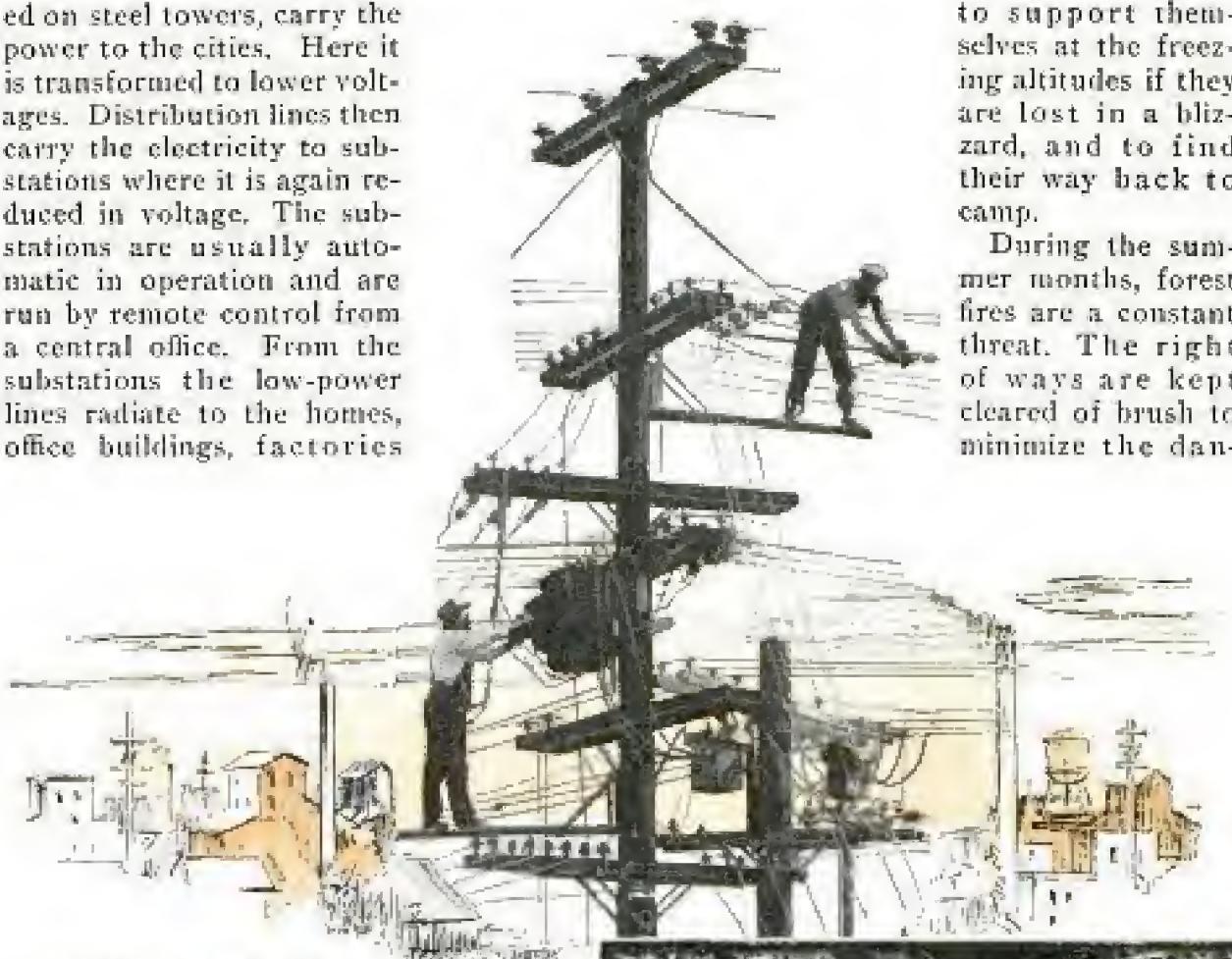
a pole that is carrying a number of circuits, ranging from 110 to 15,000 volts, must have their wits about them."

Power companies go far into the mountains to obtain their hydroelectric power. Enormous plants are built across the rivers to dam the water and direct it into the spinning turbines that generate the electricity. Electrical highways, parallel lines of thick aluminum and copper wire mount-

ed on steel towers, carry the power to the cities. Here it is transformed to lower voltages. Distribution lines then carry the electricity to substations where it is again reduced in voltage. The substations are usually automatic in operation and are run by remote control from a central office. From the substations the low-power lines radiate to the homes, office buildings, factories

to support themselves at the freezing altitudes if they are lost in a blizzard, and to find their way back to camp.

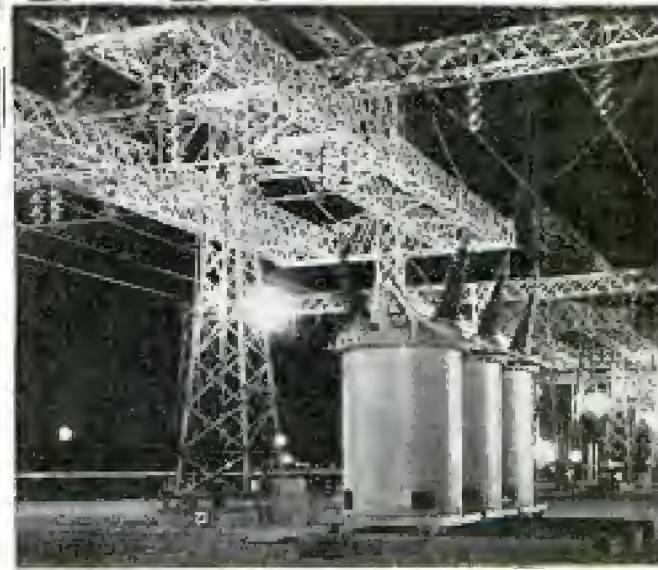
During the summer months, forest fires are a constant threat. The right of ways are kept cleared of brush to minimize the dan-



Top, Connecting New Wire;
Right, View of Part of Trans-
former Station

and all the other outlets. One such great electrical system is that of the Southern California Edison company. An intricate system of dams, diversion flumes and power plants has been constructed high in the Sierra Nevada. The hydro works cost a greater sum than the Panama canal and provide power and light for several million people. The transmission "high lines" stretch across 270 miles of mountains and desert, carrying 220,000 volts to Los Angeles.

The men who watch these wires lead adventurous lives. The maintenance crews stationed in the mountains are often snowed in for months at a time. Then their only contact with the outside world is via radio or dogsled. When windstorms or snow and ice disrupt the service, they struggle through the snowdrifts with their equipment to repair any breaks. They must be experienced mountaineers, able

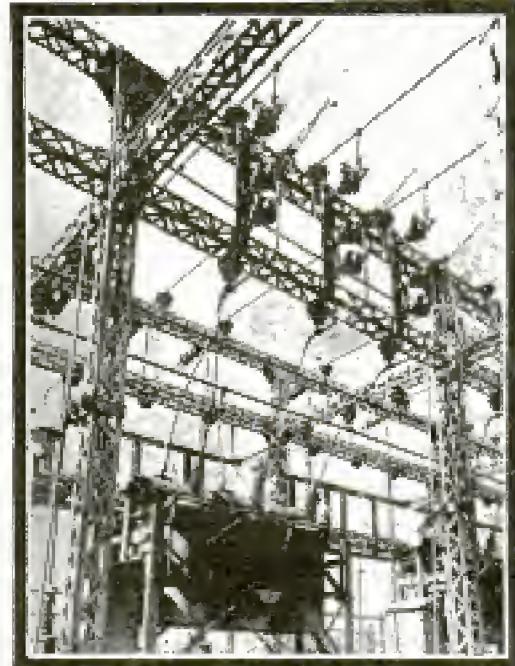


ger, but steel towers have twisted and fallen into the flames in spite of this. Linemen have standing orders to battle the blazes in their territories, and each man can count on several thrilling fights every summer.

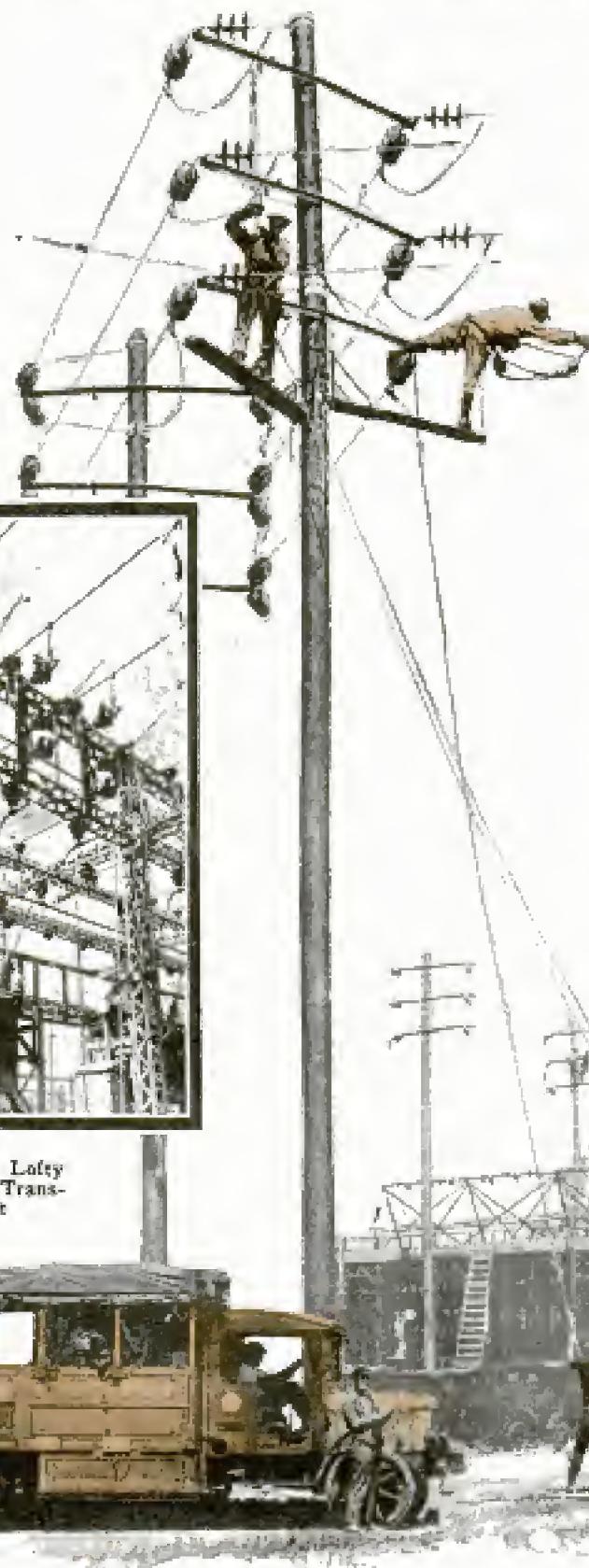
Flood waters may undermine a great steel tower and send it crashing to the ground, carrying with it a flashing wreath of wires. Earthquakes may stretch the

wires past their holding strength or topple the towers over like tenpins. In all such emergencies, in fair weather or foul, the men race against time to reach the break and restore the flow of current.

The shutting off of power from a



Linemen at Work on Lfty Perches, and Part of Transformer Equipment



city even for a short time may have serious consequences. Lights in the operating rooms of hospitals dim and go out. Burglar and fire-alarm systems fail to act, and street traffic becomes disorganized. Power companies provide against the pos-

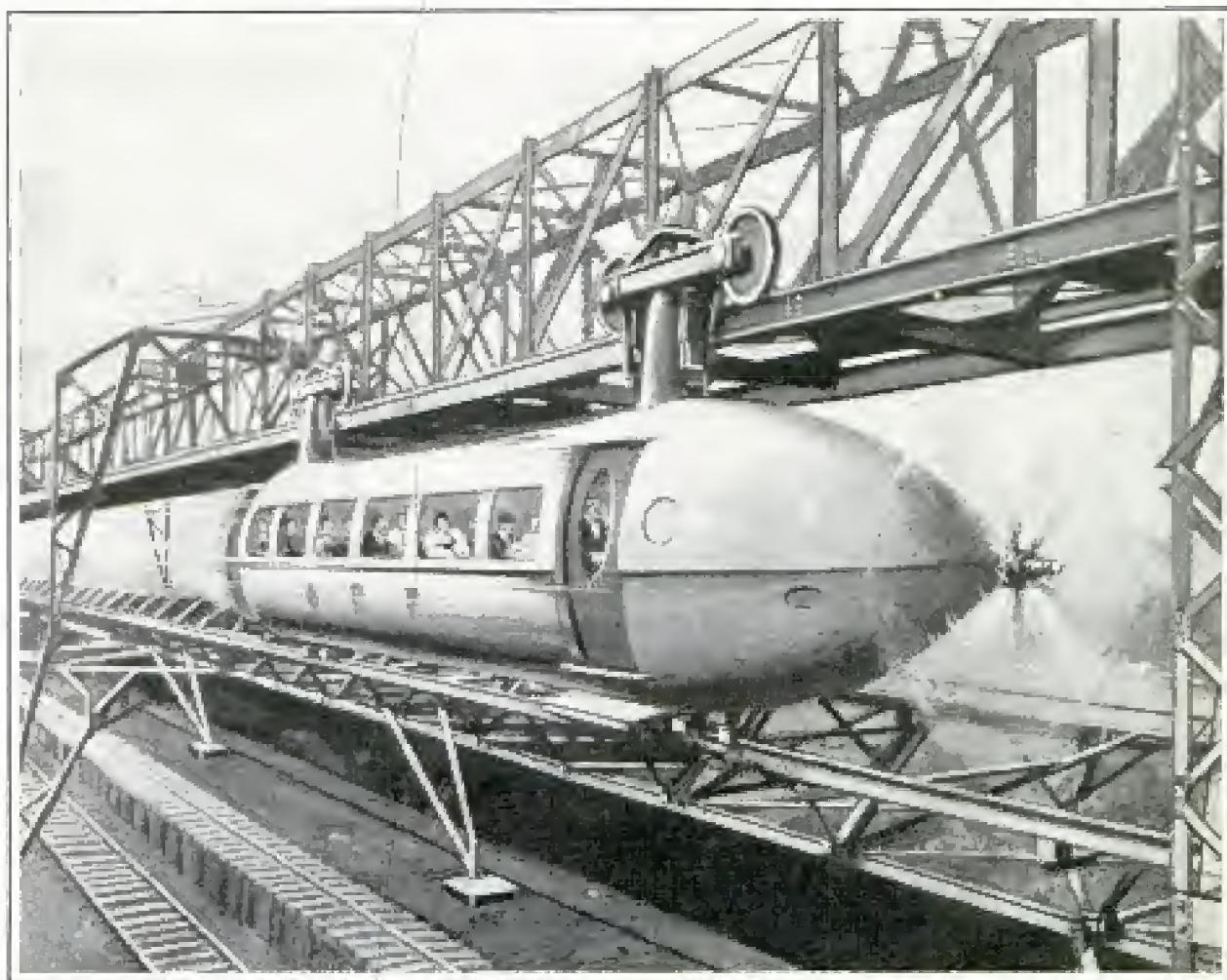
ibility of failure by building duplicate transmission lines on different routes between the sources of power and the cities. Any one line can carry the load if the others break down. Stand-by steam plants also are maintained. The value of these safeguards has been demonstrated many times.

One thing linemen hesitate to do is to work on the high lines when there is a lightning storm in the vicinity. A lightning flash may have a pressure as high as 100,000,000 volts, about one million times the voltage of the ordinary house current. A lightning stroke, even some distance from a high line,

B-247

George Bennie
POPULAR MECHANICS, Glasgow,
Scotland 722

Fast Plane on Rails Runs Above Railway



Running on a Frame Constructed above Railroad Tracks, This Propeller-Driven Car Carries Mail and Passengers at Two Miles per Minute; This Leaves Rails Free for Movement of Freight Trains

Driven by airplane propellers fore and aft, a monorail car for fast passenger transport has reached a speed of two miles a minute in Great Britain. The rail plane, under the proposal of its inventor, would run on a track built above the tracks on established routes, releasing the tracks for fast freight trains. Mail, passengers and perishable goods would be transported on the overhead railway. This plan would

eliminate the necessity of purchasing additional right of way for the rail plane. Suspended from a steel girder, the monorail car is prevented from swinging by a frame underneath. Electric motors or internal-combustion engines can be used for power. The inventor says that, in this system, the net weight carried is a greater proportion of the total weight than in any other known method of transport.

RIPE APPLES GUARD POTATOES FROM SPROUTING IN BIN

If you want to keep your potatoes from sprouting too soon, store them in well-closed bins with ripe apples. Dr. O. H. Elmer, of the Kansas agricultural experiment station, has found that tubers kept in this manner until June will remain firmer and have better qualities than those

stored in the usual way. Uniformly, he found that potato sprouts within "smelling distance" of apples failed to develop normally, growth at the ends being stopped. Apparently only ripe apples have this characteristic, since green and rotten apples had no effect on the potatoes with which they were placed. Other fruits also failed. Even peeled ripe apples will prevent sprouting, Doctor Elmer says.

Oct 195. "Beljeanne" placed in service by

728

POPULAR MECHANICS

Christen Smith Oslo, Norway

Queer Ship Carries Cargo of Railway Trains



View of Giant Motorship to Carry Nothing but Railway Trains; at Right, a Huge Boom Is Loading a Car in the Tiered Hold

Built solely for the transporting of railroad equipment, the "Beljeanne," a motorship 428 feet long, recently transported several trains ordered by the Rio Grande do Sul railroad of Brazil. The cars, of all types, were built by the Pullman company and loaded at Baltimore. They were all of narrow gauge and were stowed on their own wheels in the vessel's single hold. The ship displaces 10,400 tons and is equipped with adjustable tracks and decking to enable the loading of rolling stock

in tiers. Each of the vessel's main booms has a capacity of 1,300 tons and the center of gravity is so low that it may heel at least forty-five degrees without capsizing. As the cars are lifted into the hold, they are individually lashed with heavy steel cable, then, after a deck is loaded, the whole group

is once more lashed and secured by turnbuckles, thus making it impossible for any of the cargo to shift during a storm at sea. This process is repeated deck by deck, until the cars are all stowed.

SCALES FOR WEIGHING ATOMS HAS TWO-TON MAGNETS

Atoms can be weighed on a two-ton balance whose pointer is deflected by one-sextillionth of an ounce. Immense magnets, which account for the great weight of the scales, create a field into which are shot a stream of electrified particles, called ions, which are constituent parts of atoms. It works like the spray of a fountain, the

ions rising into the magnetic field, curving over to one side and falling straight down on a photographic plate. The stream of ions is the scales' pointer. Heavier ions shoot higher and curve wider, falling farther out. Thus a "fat" particle will land farther out on the sensitized plate than a "lean" one. Each leaves a black mark where it strikes. The distances between these black marks show the varying atomic weights, just like the lines on the

at Bartol Foundation Scovingsmore

Copyright material
Pa.

Charge Oct
10/11/32

butcher's scales. That there is a difference in the weights of atoms already has been proved. One result of the scales is expected to be discovery of power to operate engines.

B. 367

BEARINGS FOR LATHE CENTER ALLOW IT TO REVOLVE

Lathe centers mounted on ball bearings, allowing them to revolve freely have been designed by German machinists. It is the customary practice to build lathes with both centers fixed. As the cutting tool begins operating, friction is set up which is transmitted to the center suspension, and the work slips from the stress, causing the centering hole to be enlarged and vibration and wobble of the work. With a ball-bearing-mounted center, however, the stress will come only at the cutting point.

B. 292

FENCE OF CORRUGATED METAL PROTECTS AUTOMOBILES

Experiments are being conducted with a type of corrugated-metal fence along dangerous highways, not only to keep automobiles from plunging over an embankment, but to protect them from serious damage as well. Strips of metal are attached to posts by a spring arrangement, making the fence a sort of shock absorber. When a car strikes such a barrier, the springs tend to relieve the shock, and the car slides until it comes to a stop. The metal is covered with aluminum paint to make the fence easily visible at night.



Highway Fence of Corrugated Metal, Attached to Springs, Which Does Little Damage to Autos.

on Route 40 west of
Kansas City, Kansas



Developing Tank for X-Ray Films Which Are Sealed in Porous Envelope for Daylight Work

FILMS DEVELOPED IN DAYLIGHT SPEED X-RAY WORK

Sealed in a porous, opaque envelope, X-ray film can be developed without the use of the dark room. Dr. S. T. Jonas, of Chicago, has invented an envelope which guards the film from light, but allows developing chemicals to reach the film. X-rays may be made with film wrapped in the envelope at the factory, the paper being removed only after the developing process is far enough along to permit exposure. A developing tank, also invented by Doctor Jonas, stirs the X-ray film for five minutes, lifts it into the water for washing, then into the hypo bath and finally holds it up to a fan for drying. The entire operation is automatic.

The Popular Mechanics' Bureau of Information offers its free service to all readers of our magazine. Names and addresses of manufacturers and dealers in articles described, and any other details in our possession, will be promptly furnished by addressing the bureau.

Mfr. Herman L.
Carswell Mfg. Co.
Kansas City, Kansas

135 of state.

B. 63 Cmt. This is Stevenson Jr.

145

of Spring St

Los Angeles Calif

LOST



ONE night three hundred years ago, a lumbering Spanish treasure ship, loaded with gold and jewels from Manila, was proceeding cautiously down the uncharted California coast. The moon was hidden by fog and the lookout stationed aloft strained his eyes to pierce the gloom. Suddenly he heard the sound of breakers. Before he could shout a warning, the ship struck.

To locate this wreck and dozens of others, western salvage seekers are poring over old records and charts. The Pacific coasts of the two American continents

are strewn with the wrecks of centuries. There is no telling how many treasure galleons were lost between San Francisco bay and Cape Horn. Even vessels of the California gold-rush days, carrying bullion and gold dust to Panama, came to grief on the unmarked shoals and jagged reefs of the treacherous coast.

As early as 1593, "because of the frequent disasters befalling the Philippine ships," explorers were sent from Mexico to discover harbors in California where the vessels might weather out storms. One of these explorers was Sebastian Vizcaino, who visited Catalina island, near Los Angeles, in 1602. His log states that Indians on the island showed him some damask cloth which they said came from the wreck of a large ship. Late in the last century,

TREASURES of the PACIFIC



archeologists digging into Indian graves on the island came across numerous metal objects, including clappers from ships' bells.

These facts confirm the local tradition that centuries ago a Spanish galleon foundered on Ship's rock at the entrance to one of the anchorages. It is said that fifty years ago the outline of an old galleon could be made out in 100 feet of water close to the rock. Salvage seekers, working on the theory that where there is smoke



there is fire, are tracing down all of these traditions to their sources.

Indian graves are not yielding as many metal objects salvaged from the wrecks as had been hoped by those who are investigating. According to Malcolm Rogers, Jr., of the San Diego Museum, the chemical nature of the soil along the California coast and the outlying islands rapidly disintegrates buried iron. Even the impure copper and bronze of 200 years ago is



Top, Examining Coins Pressed into Seats of Steel Vessel After It Was Wrecked off Lower California; Left, a Spanish Treasure Chest

affected by the soil. There is an Indian legend that a Spanish vessel struck on San Nicolas island, far off the coast, but no trace of it has ever been found. The only evidence that there may be truth to the tale was found in one grave, where a metal object had once been buried. Only a mass of rust remained when the grave was opened.

Southwest of the Coronado islands, off San Diego, is Cortez bank, a sunken island whose summit is only fifteen feet below the surface of the water. Persistent legends say that at least two galleons are



lying close to the rock. There have been various plans to explore the area, but no well-financed attempt has been made. Salvors will have to clear away part of the thick kelp forest that covers the bank. Divers will have difficulty in breasting the strong under-water currents that sweep across the shoals.

The richness of the cargoes that were carried by these vessels of an earlier age is described in the accounts of the English pirates who attacked the galleons in the vicinity of Cape San Lucas, the tip of Lower California. Sometimes the bars of gold, silver plate and precious stones amounted to more than \$10,000,000 per ship. In 1587, Sir Thomas Cavendish looted the galleon "Santa Ana" of \$5,000,000 worth of gold, silver and jewelry. Part of this treasure was loaded onto the "Content," one of the pirate vessels, which later was wrecked off the Lower

California headlands. Sir Francis Drake, Anson, and other pirates, also lay in wait for the galleons which escaped the dangers of the Californias. Sometimes the buccaneers carried their loot to Europe; sometimes they buried it for safekeeping on one of the islands off the Mexican coast. Hardly a year goes by but some expedition searches for the treasure troves of the pirates on Guadalupe island, Las Tres Marietas and Tiburon island.

When Drake prepared to cross the Pacific after his encounters with the galleons, he found his ship so heavily laden with treasure that he was forced to drop much of it overboard. Ton after ton of gold and silver bars were thrown over the side, and following these were sea



Top, Lookouts of Treasure-Seeking Boat Watching for Shoals and Reefs; Below, Seventy-Pound Gold Ingots Recovered from a Wreck

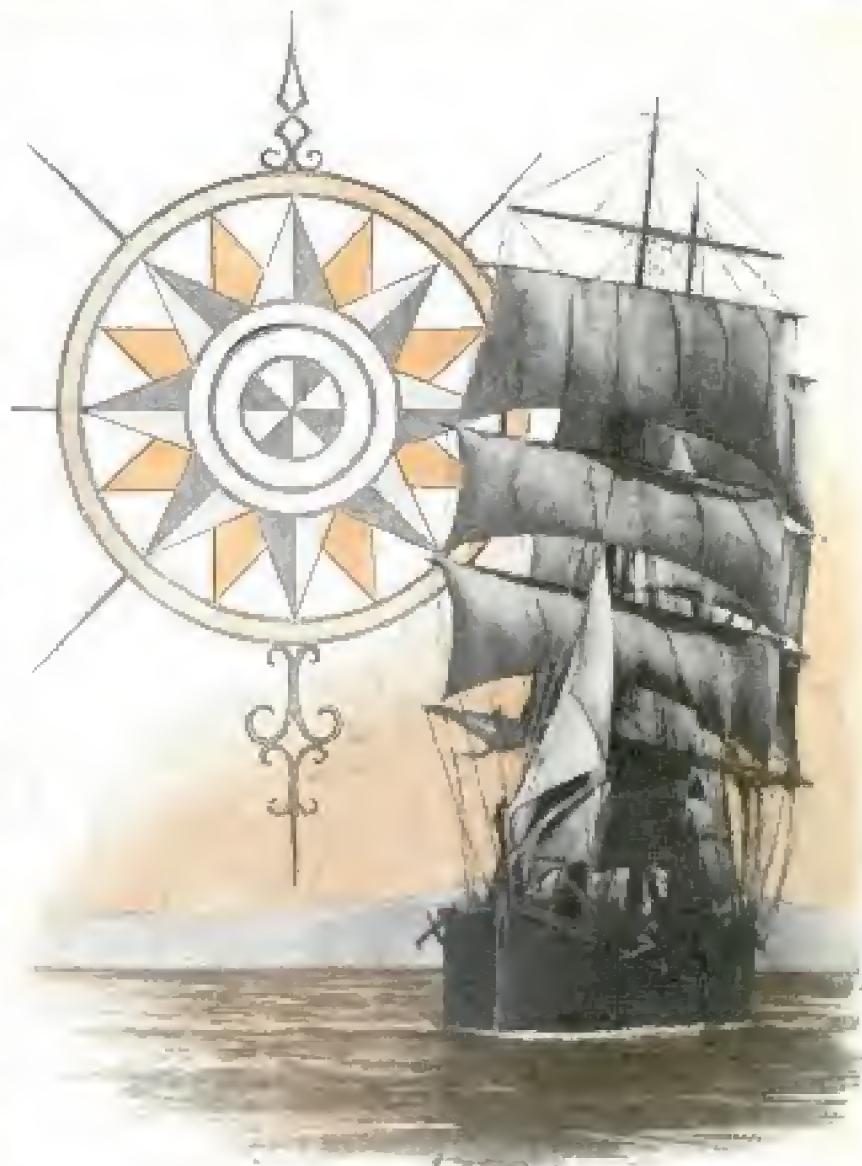
chests full of pieces of eight. This occurred in a quiet bay of the little island that is called Drake's island, or Plate island, between Cocos island and the Galapagos group. The amount that Drake retained on board the "Golden Hind" amounted to \$15,000,000.

When gold was discovered in California,

in 1849, there were no transcontinental railroads, and much of the bullion from the mines was transported by sea. Square-riggers and side-wheelers sailed from San Francisco to Panama or around Cape Horn to New York. Of these ships, also, the sea exacted its toll. The few records that survived the San Francisco earthquake and fire reveal some interesting information for the treasure seekers. Among the lost bullion ships were the "Yankee Blade," "Sacramento" and the side-wheeler "Golden Gate."

About fifty miles north of Santa Barbara is Point Arguello, a veritable marine deathtrap. The strange currents that set in toward the point have cast more than twenty ships on the rocks and have given the area the name of the "graveyard of the Pacific." One of the earliest vessels to be wrecked here was the "Yankee Blade," which sank in 1854, southbound with \$154,000 in bullion. The wreck of the "Yankee Blade" lies only a few fathoms deep, close to the shore, according to the old accounts.

In 1862, the "Golden Gate" caught fire at sea, en route from San Francisco to Panama. In the strong room were three heavy boxes containing bullion valued at \$1,500,000, together with a safe stuffed with the accumulated wealth of the returning passengers. The ship was beached in the surf fifteen miles north of Manzanillo, Mexico. The hulk is still there, almost buried in the sand, and may be approached at low tide. Salvage operations were started during the Civil war by tugs brought around the Horn from New York and have been repeated at intervals ever since. So far, only a small fraction of the



Courtesy Pacific Coast Yachting Magazine

A Square-Rigged Clipper of Former Days; the Wrecks of Boats Such as This Are Sought by Treasure Hunters Along the Pacific Coast

treasure has been recovered. Halfway down the coast of Lower California, forty miles off shore, is Sacramento reef, so named after the treasure ship which struck the unmarked rock in 1873. The "Sacramento" carried \$1,000,000 in minted California coin in its hold, and some of this wealth was taken off by the survivors of the wreck. The location of the "Sacramento" is well known, but the waters in the vicinity are so treacherous that no real efforts have been made to recover the treasure that remains.

Names and addresses of manufacturers of articles described in this magazine will be furnished free upon application to our Bureau of Information.

*Sherley's Official Mexican Expedition
Concessions, "Golden State" Expeditions
230 Tyler St. Dallas, Tex.^{co}*

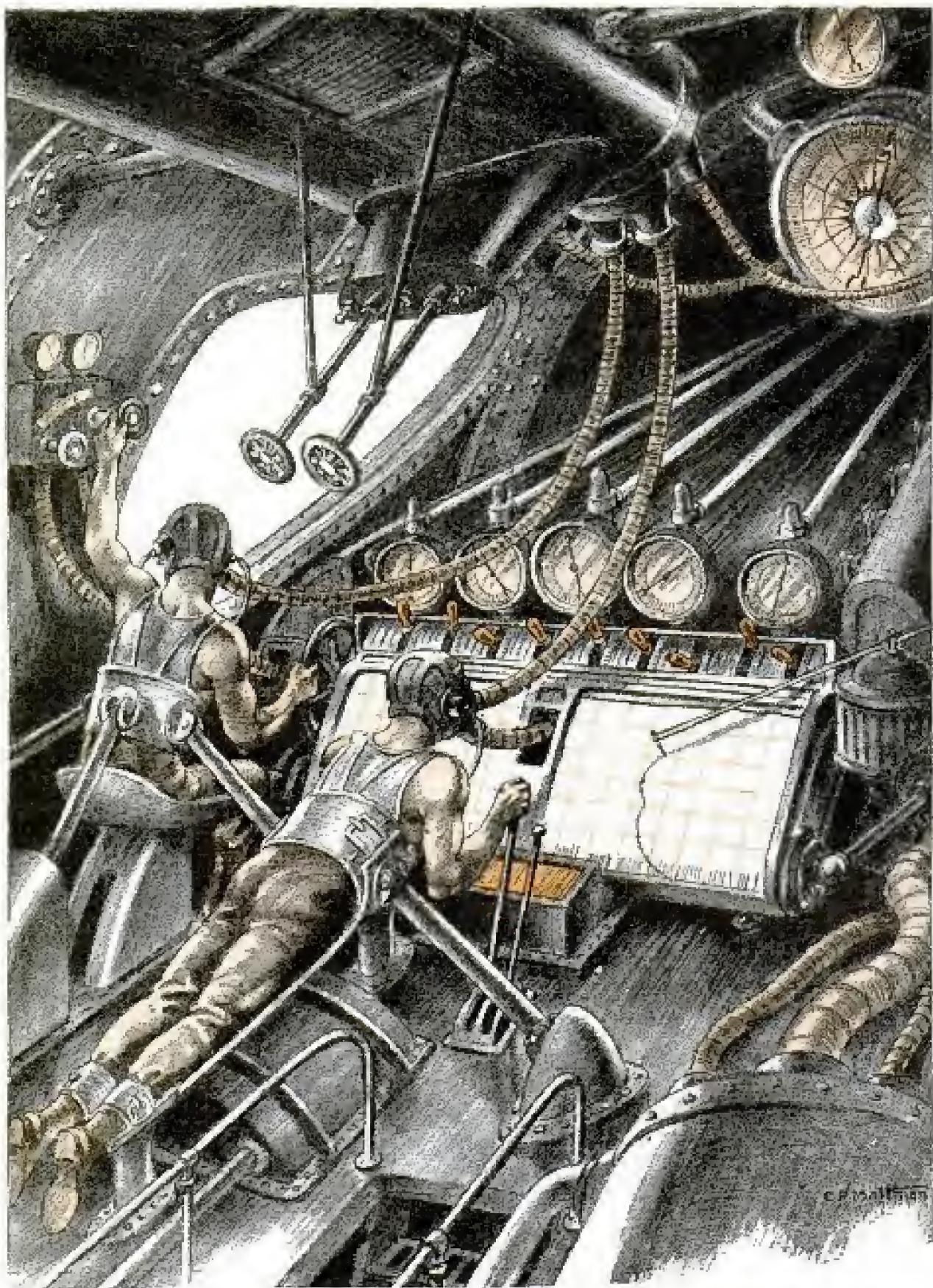
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B-196 Capt. Hans J. Rittelbach
734 Schwarzhauserberger Dr.

POPULAR MECHANICS

Berlin, Frankfurt, Germany

At the Controls of an Aircraft of the Future



An Artist's Conception of the Way Rockets Will Be Guided in Their Flights through Space by Pilots Strapped in a Sealed Compartment

MAN-CARRYING ROCKET SHIPS PRESENT MANY PROBLEMS

Rocket-propelled airships of the future may resemble present-day Zeppelins, except that they will be equipped with stubby wings that telescope into the sides of the craft when not needed. Ships big enough to carry passengers still present many problems, but those experimenting with such a form of travel are already speculating on the construction and operation of the craft when they do make their appearance. Some German inventors believe these ships will be catapulted into the air as is now done with airplanes, and will ascend at the start with the aid of short wings. Upon reaching the stratosphere, the wings might be withdrawn into the hull after which rockets alone would provide the power. In leaving the earth, the speed of the craft would be held down because the occupants would be unable to withstand the tremendous pressure, but at a height of about 600 miles, the ship might be expected to attain its full speed, estimated at 250 miles a minute, a journey from Paris to Chicago requiring fifteen minutes at such a rate. The crew of a rocket ship of this sort would be strapped in places in an air-tight compartment with its own oxygen and heating plant. At a speed of 250 miles a minute, or 15,000 miles an hour, landing would present as much of a problem as the actual flight. In



Anne

Illustrated

using Penzance collection in Schleswig

Rep. John P. Delaney
Prof. of Physics &

Carnegie College
Science Observatory

New York
from loss by melting in
an atmosphere in which
some other gas is substi-
tuted for oxygen. Nitro-
gen is one of the best.

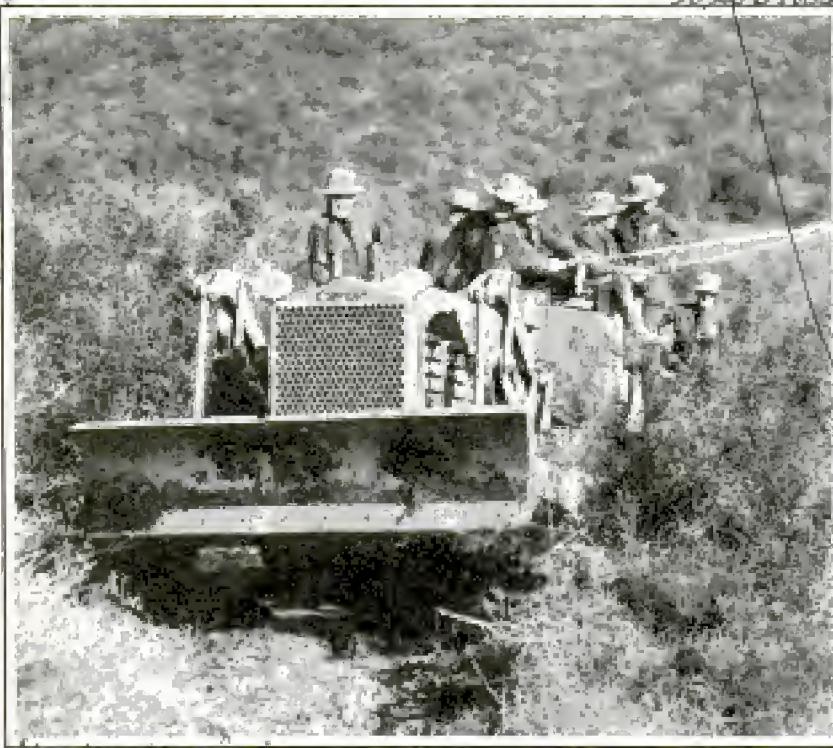


Photo by W. H. Johnson
Mountain Fires Can Be Fought by This Tractor Which Crawls over Ravines
and up Steep Grades with Its Nine-Man Crew

FIRE TRACTOR FOR MOUNTAINS CLEARS ITS OWN PATH

Clearing its own path, a fire-fighting tractor for use in mountainous country has been tested by the Los Angeles fire department. The machine is designed especially to combat brush fires in the hilly sections of the Southern California city. Though it runs on tracks, it can climb steep grades and cross ravines.

By attaching a photo-electric cell, or "eye," to the recording mechanism of his seismograph, one scientist has set a watch for earthquakes. The cell sends a warning signal to the observatory office when the recording of a shock is begun. Ordinarily the observer discovers an earthquake only after development of the seismograph record. The electric eye assures im-

mediate warning. Safety devices and alarm signals might be set in motion by the cell in regions subject to earthquakes at the same instant that the observatory gets its warning.

STREET CLEANER RUN BY HAND LOOKS LIKE PERAMBULATOR

Paris streets are being swept by hand-
ing machines that resemble

ELECTRIC EYE SEES AND WARNS OF QUAKES

By attaching a photo-electric cell, or "eye," to the recording mechanism of his seismograph, one scientist has set a watch for earthquakes. The cell sends a warning signal to the observatory office when the recording of a shock is begun. Ordinarily the observer discovers an earthquake only after development of the seismograph record. The electric eye assures im-

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Science Service

1931

STREET CLEANER RUN BY HAND LOOKS LIKE PERAMBULATOR

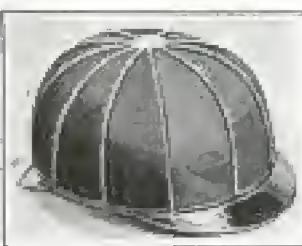
Paris streets are being swept by hand-
ing machines that resemble

descending, experimenters believe the wings would again be brought into use and possibly rockets in the bow would be employed to aid in braking and reducing speed.

B-429

BAKELITE HATS FOR POLICE GIVE EXTRA PROTECTION

German policemen now are wearing bakelite hats. Recently the standard equipment for such peace officers was changed to include molded helmets which afford protection and are more durable than steel. The head-pieces resemble patent-leather dress helmets worn by German officers during the war.



*akelite Corps
247 Park Ave
new York*

This "Debtors' Chair," Used 300 Years Ago, Tilts Backward When Victim Sat Down in It.

DEBTORS TRAPPED BY CHAIR IN BYGONE DAYS

Back in the seventeenth century, debtors were forced to sit in a "debtors' chair," an example of which recently has been placed on exhibition in the Washington gallery. The chair was richly carved and ornamented with crests and coats-of-arms. Its principal peculiarity, however, was its habit of tilting backward as soon as the victim was seated. The tilting actuated a mechanism that caused iron clamps to pin the occupant's limbs to the chair. The victim then might be the target for a few stones or several buckets of water hurled by his creditors.

[An electrode that can be used for welding sheet or cast aluminum has been developed recently.]

*Lincoln Electric Co
Cleveland, Ohio*

the road; the tractor can travel over ravines and hills ordinarily inaccessible to men. It hauls a water tank which shoots four streams of water at 200 pounds' pressure, requires a crew of nine men and can climb grades as steep as sixty-two per cent.

METALLIC SKIN GUARDS ALLOY FROM FURNACE LOSSES

B 359
Covered by a metallic skin, brass alloys can be protected from furnace losses, saving millions of dollars. These alloys shrink in melting, due largely to metal that boils away into the air. The losses are high, because brasses are five to ten times as costly as iron alloys and also boil more readily. Oxygen crusts formed upon the liquid surface make a skin or blanket which retards the escape of volatile elements. Zinc alloys also may be protected in this manner. Lead and tin alloys can be guarded

operated cleaning baby carriages and are pushed just like these. A revolving brush beneath the cart sweeps up all dirt encountered and deposits it in a container.



© International Street Cleaners on Paris Boulevards Pushing Sweepers That Look Like Perambulators

Dept. of Engineering Research,
University of Michigan
Ann Arbor, Mich.

Canal
Makers

Race of Appearances
Nestagee Whate



© International News Photo

Model of a Battleship in Cross-Section Form with Instructors Pointing Out the Various Parts of the Ship to Apprentice Seamen Who Thus Become Familiar with Craft and Its Operation

MODEL OF NAVAL VESSEL USED TO INSTRUCT SEAMEN

Apprentice seamen at the naval training station at Newport, R. I., become familiar with all the compartments of a naval vessel before ever setting foot on a man-of-war. This is accomplished by means of a model of a battleship in cross-section form, instructors pointing out to the novices every part of the vessel from the gun turrets to the engine room.

HEAT-SENSITIVE PHOTO PLATES TAKE PICTURES IN DARK

Photographic plates that "see" heat, take pictures in the dark and have to be kept packed in ice until used have been produced in the United States. A new dye is applied to the plates, making them sensitive to infra-red radiation, the invisible light. Pictures of a flatiron have been taken in the dark, the iron's heat rays making the impression. Many new qualities of chemical elements have been discovered by the new plates, which record a wide band of invisible light. In addition, these plates have a speed from one hundred to one thousand times that of the best plates ever used in the infra-red field. Astronomers, aided by the new plates, have discovered iron lines in two groups of stars. They expect important discoveries when the large photographic

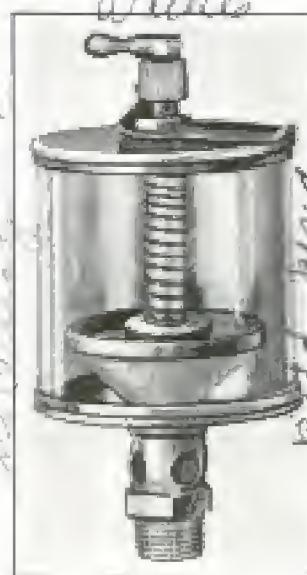
telescopes are loaded with these plates, which can see bodies invisible to the human eye and ordinary photographic plates. Heat from the sides of ordinary container at room temperature will fog the plates, so ice packing is necessary.

B-444

OIL-CUP FILTER INSURES SAFE LUBRICATION OF BEARINGS

Requiring but five minutes to install, a filter that will fit ninety-five per cent of the lubricating cups in industrial use has been devised. Installation of the filter does not retard oil flow, as the capacity is considerably greater than that of the exit hole in the cup proper.

It is said that more bearing failures and other time-consuming shutdowns result from dirt and foreign matter in the oil stream than from any other one cause. The filter is made to last indefinitely and can be cleaned once a year in about five minutes. It does not interfere with visibility of the oil level in the cup.



Demonstrated by Mr.
C. G. Kennell, Director
Eastman Kodak Co.
Rochester, N.Y.

Howard B. Morrow,
a Porte and
Copyright © Popular Mechanics

B. 350

738

POPULAR MECHANICS

My Herald Token
2/28/32



Thomas A. Edison's Role in Lighting the World Would Be Memorialized by This "Eternal Flame" in a New Jersey Town

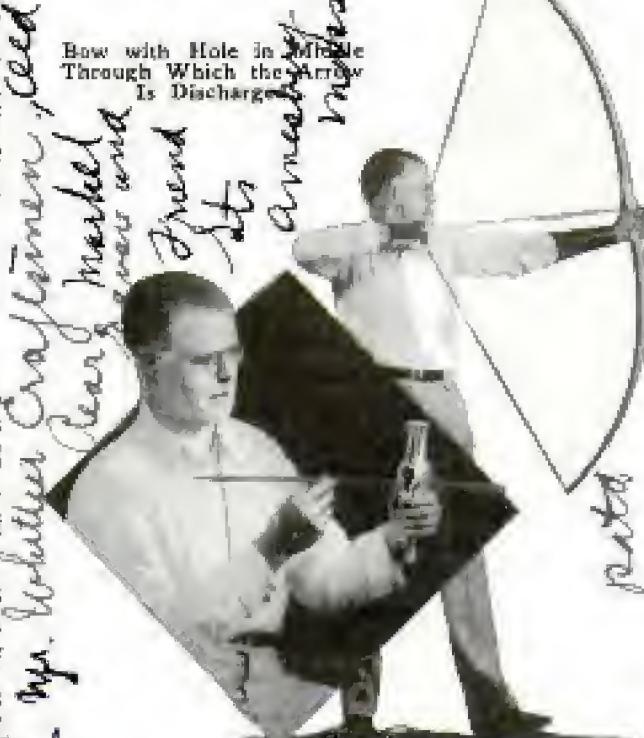
"ETERNAL FLAME" IS DESIGNED AS EDISON MEMORIAL

Designed as a memorial to Thomas Alva Edison, a museum and eternal light will be located at Perth Amboy, N. J., if the plans receive approval. The structure, which would be circular, would measure 180 feet across and be surmounted by a shaft 175 feet high. At the top would be a light, never to be extinguished. Cost of the project is estimated at \$850,000. The Edison Parkway commission of Perth Amboy has approved the design.

do not draw slowly. With such equipment, the inventor says, it is possible to triple the accuracy of this weapon as compared with the ordinary bow.

whitebo

Bow with Hole in Middle Through Which the Arrow Is Discharged



SMALLEST OF ALL PARTICLES IS FOUND IN "NEUTRON"

So minute it carries no electrical charge, the smallest particle known to man has been discovered by a British scientist and named the "neutron." Hailed as the greatest find since the electron, the proton and the X-ray, the neutron is really matter in the process of being formed. It consists of one electron and one proton, the positive and negative charges of electricity of which all matter is made. The neutron is the link between the simplest form of

Mr. James Chadwick (now. Colin J. Campbell
Cavendish Laboratory printer, Amesbury, Mass.)
Cambridge Univ. England

matter and absolute electricity, or energy. Since neutrons contain a single unit of positive and a single unit of negative energy, they have no electrical charge, as the units neutralize. They are of highly penetrative nature, one scientist declaring that if it were possible to make a cannon ball of this matter, it would penetrate 75,000,000 miles of armor.

B. 257

HOLE IN BOW GUIDES ARROW AND GIVES ACCURACY

For greater accuracy in longbow shooting, one archer has invented a bow with a hole in the middle through which the arrow is discharged. The bow contains an aluminum center piece with an orifice through which the arrow can pass freely. It is claimed the guide prevents the wobbling of the arrow of which some archers complain, particularly if they possess a strong, steady hand and

do not draw slowly. With such equipment, the inventor says, it is possible to triple the accuracy of this weapon as compared with the ordinary bow.

whitebo

Bow with Hole in Middle Through Which the Arrow Is Discharged



Edison Parkway Commission

A HOBBY that turned into a BUSINESS



By CALVERT HOLT

MY interest in steam locomotives started as a boy watching the trains come and go into the Grand Central station in New York. Almost every afternoon, I could be found there and it was with real regret that I saw the last real steam locomotive leave the station in 1906. I made up my mind then to be an engineer some day, and was able to realize that ambition fourteen years later. For nine months I fired engines, but was called home by the illness of my father.

A short time later my interest was aroused by a description of a miniature

The Little Locomotive, Seen Crossing the Trestle, Can Pull a Load of 900 Pounds; Below, Mr. Holt at Work in His Locomotive Shop

locomotive built by L. Lawrence, of London, England, one twenty-fourth full size. This engine had pulled the astonishing load of 700 pounds. It weighed a little more than twenty pounds and had a track gauge of two and a half inches. The boiler was three inches in diameter and one foot long, and burned coal in a min-

Mead Lane, Greenwich, Conn.

L. Holt - Photos by C. Wallachine, Machine Tool Co., Connecticut, Burke



Top, One of the Stations of the Miniature Railroad Line; Below, the Tiny Engine Is Pulling Six Passengers Twenty-Two Feet a Second

ature fire box. It was complete to the last detail with water glass, pressure gauge, blower feed pump and throttle.

After this I was anxious to build an engine myself and rigged up a small workshop in the attic of my house. My only experience was a few lessons on how to run a lathe, and as I had no technical training, I found the going very slow. However, as a hobby it became more engrossing, and due to an order from a model collector for some small locomotives, I

found my hobby gradually turning into a business. One satisfied customer brought another, and it became necessary to enlarge the shop to take care of the orders. A small railroad was built largely for my own amusement, but it since has proved to be of interest to all the boys in the neighborhood, and it is very convenient for showing the hauling capacity of these miniature "iron horses."

Just now I am finishing the largest model I have built. It is over twelve feet long with a gauge of seven inches and will weigh 1,000 pounds. It develops approximately ten horsepower and will pull about ten tons. My first model cost \$1,200. Not more than one ten-thousandth of an inch was allowed as leeway in measurements. Even in laying the tracks, a suitable length had to be found so that the expansion or contraction could be taken care of with the changes in the weather. If a ten-foot length were used, the expansion in summer heat would be so great as to warp the

M. S. Forest Service

B. 459 Scovill Mfg Co

POPULAR MECHANICS

741

Waterbury, Conn.

Service Service

track into uselessness. The rails had to be made short enough so that each section could have a sufficient space for expansion without derailing the engine.

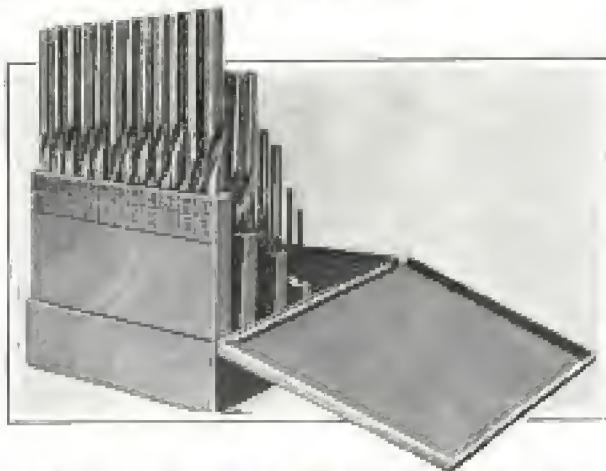
B. 525

RANGERS TO CARRY RADIO SETS IN FIGHTING FOREST FIRES

Fire fighters in national forests will go into the field this summer with transmitting and receiving radio sets packed on their backs. Each set weighs but ten pounds, but will enable the forest personnel to keep in constant touch by signal code. A twenty-five pound set for transmitting the voice will be tried out, but this type will be transported on horseback. Broadcast of the voice up to a distance of 100 miles is possible with this heavier set.

DRILL CONTAINER LIKE A BOOK KEEPS BITS IN PLACE B. 309

Small drills can be kept filed and indexed exactly where they can be found at any time by means of an index recently developed for the purpose. The panels containing the bits fold into the box like the pages of a book, and the drills will not fall out even though shortened by breakage, sharpening or long use. The panels are individually drilled, not die-cast, and each hole is marked by sixtieths of an inch and in decimal equivalents. The case is small enough to fit easily in a coat pocket. Three sizes are available, one from a sixteenth to a half inch by sixtieths, one for wire-gauge sizes from one to sixty, and the third for fractional drills, one-sixteenth to one-fourth inch by sixtieths.



"Filing Case" for Fractional Drills, Made Like a Book, and Small Enough for Pocket

*H. H. Hobart Mfg Co
St Paul, Minn.*



Simple in Operation, This Handy Atomizer Has Fountain-Pen Shape and Clip for Carrying

INHALER LIKE A FOUNTAIN PEN WORKS WITHOUT BULB

Shaped like a fountain pen and fitted with a clip for carrying in a pocket or handbag, a bulbless atomizer and inhaler is ready for the market. An air stream created by inhaling through the nose shield breaks up the medication into a saturated vapor or spray. Aqueous or oily solutions can be used. A shut-off prevents leakage. Since no mechanical force is used in sending the solution through the nasal passages, the inhaler is particularly effective for children.

CABINET IN RESTAURANT CHAIR GUARDS HAT AND COAT B. 524

Customers may lock up their hats and coats in new restaurant chairs equipped at the back with a shallow cabinet. When the user opens the doors, an aluminum rod projects and over this, overcoat or fur may be hung and hat deposited. As the customer sits down, the cabinet is automatically locked and remains so until weight is taken off the chair.

*Drawn by Arthur J. Hagg,
London artist
Copyright material*

Wilkes

B. 390 Junkers Ju-52.

742 POPULAR MECHANICS
Operated by Canadian Airways Ltd

Flying Box Car for Sky Lanes of Northland



Interior and Exterior Views of Freight Plane; Note Use of Crane in Loading at Top, and Arrangement of Loading Hatches

Destined for heavy freight duty in Canada's northland, an "aerial box car" is flying the sky lanes north from its base at the Stevenson aerodrome, Winnipeg. This remarkable all-metal plane is constructed of riveted duralumin and chrome-nickel steel. Of full low-wing cantilever type, its landing gear is fitted for wheels, skis or floats, making it an all-weather, all-country plane. It has a cabin length of twenty-one feet and a wing span of nearly ninety-seven feet. The engine has twelve cylinders, is liquid-cooled, capable of developing 680 horsepower, and geared down, two to one, to a four-blade propeller. Perhaps the most important feature is to be found in the double wing arrangement. This innovation, patented by Junkers, consists of a narrow auxiliary flap running along the whole length of the trailing edge of the main wing. This flap is divided about midway of each wing into two sections. Displacing both sections of the flap to the same degree effects variations in the camber of the wing; the outer half of this flap does duty as a normal aileron. The practical point of this arrangement is that it permits an otherwise cumbersome machine to land in a relatively small field. This flying freighter has a normal range of 925 miles, but this can be increased to 1,863 miles by the installation of two

ent C. H. Shpgs. 209 King St.
ent Herkunft See Canada

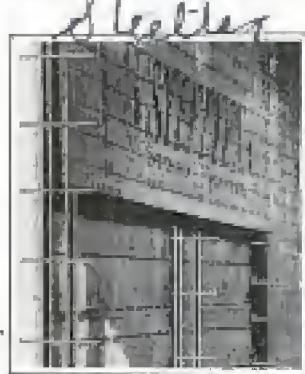
national steel B-402 *and John Weger*
& fabric Co. POPULAR MECHANICS 652 South 74th
trust Bldg. Pittsburgh Pa. *Dayton, Ohio*

extra fuel tanks. The service ceiling is given as 13,500 feet, and maximum speed as 118 to 121 miles per hour, with a fuel consumption of 1.54 pounds per mile. With a flying weight of 11,325 pounds, an average cruising speed of 100 miles per hour was maintained between cities on its trip west from Montreal to Winnipeg.

B-44

STEEL-UNIT WALL PARTITIONS MAKE HOUSE ECONOMICAL

Economical construction of walls for houses or other buildings is possible with a steel unit now on the market. Two channel pieces are used for a single stud to which galvanized wires are welded by electricity. These wires, extending slightly more than one inch beyond the face of the channels, are used as attachment prongs in lathing. A lath, composed of wire mesh and heavy paper backing, is pushed against the wire prongs, the prongs puncturing the paper. Then they are bent over the reinforcing mesh of the lath, holding it firmly. A rigid partition results, since such a wall can be erected speedily. Since the wire prongs are already in place and need only be bent over, the costly

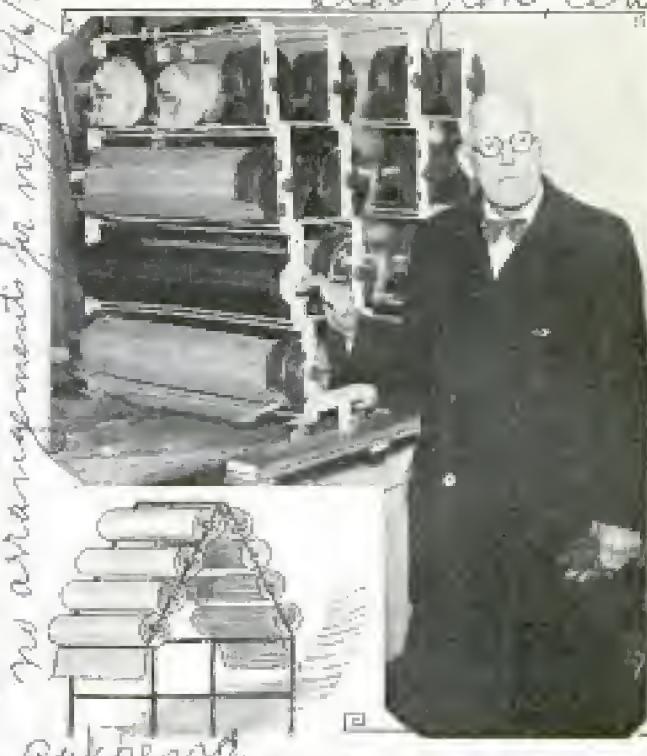


sheeted
heavy paper backing which separates the steel of the lath from the steel stud.

HONEY IN TUBES SQUEEZED OUT LIKE SHAVING CREAM

Honey now is being packed in collapsible tubes, like those used for shaving cream and toothpaste, and is squeezed out in the same manner. The containers are in various sizes and eliminate the mess usually encountered in handling this food. If the honey crystallizes in the tube, all that is necessary is to dip it in warm water for a few minutes.

*John L. Hawkins,
Box 203
Chester, Pa.*



RACK FOR WIRE-SCREEN ROLLS SOLVES HANDLING PROBLEM

Solving the problem of handling wire screen in hardware stores, a retired dealer has developed a rack which holds the rolls so that there is no frizzling. The device consists of four rods of unequal length for the stock widths of the screen. Each rod has a handle for rewinding and cylindrical guards on the ends to prevent unraveling, common to the old rack.

RUBBER BASE FOR DESK PHONE PREVENTS SLIPPING

B-253
Slipping of the desk telephone is prevented by a rubber base like a tiny auto tire, which fits over the bottom of the instrument. It is particularly useful for the dial telephone as the phone cannot move while the dial is being used. It also protects highly polished surfaces on which the telephone may be placed.



*Tel. A Site
523 Commerce Bld.
Milwaukee, Wis.*

03.395

PAINTINGS



Painters Putting the Finishing Touches on One of the Huge Four-Story Linen Canvases

1/6 Armstrong Stage
Equipment Sheds
1717 Cordova St.
Los Angeles, Calif.

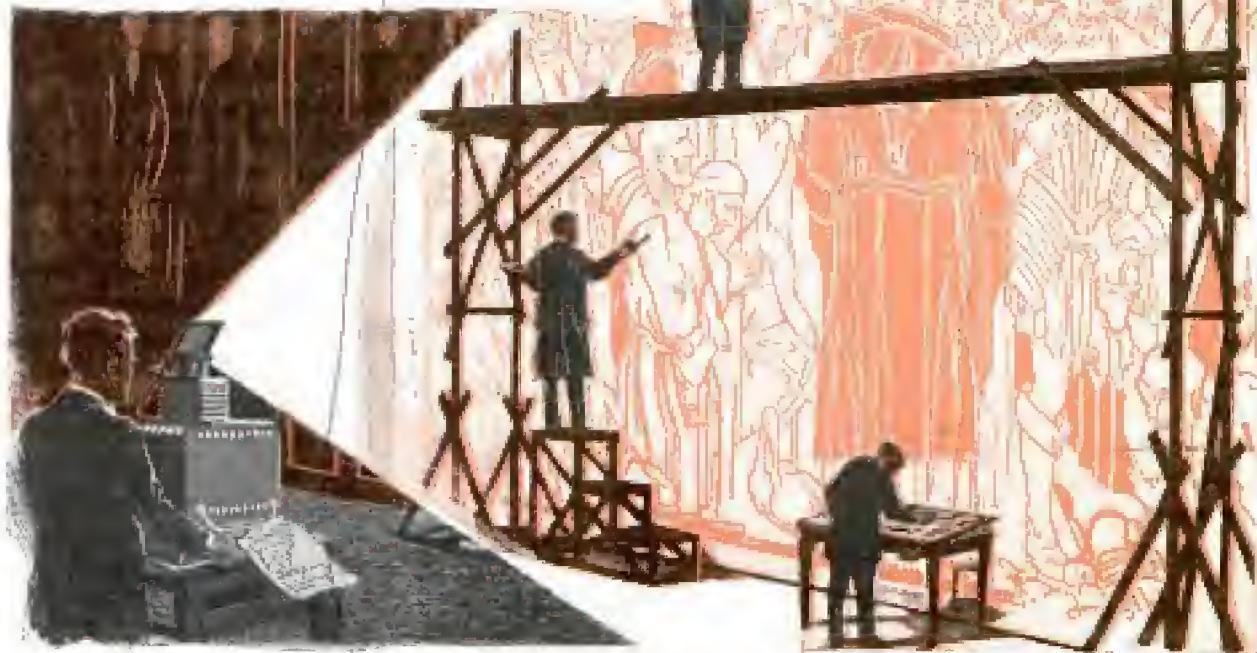
Four Stories High

Made With
Magic Lantern

FOUR paintings, each four stories high, are being completed after five years of work by Dean Cornwell, noted American artist. With the exception of stage drops and Michelangelo's in the Sistine Chapel, they are believed to be the largest paintings in existence. The huge canvases, together with eight smaller ones, all depicting the history of the west, are to be hung in the Los Angeles public library.

To assist him in his task, Cornwell is using a "reflectoscope" similar to a magic lantern that projects the details of his small originals onto the large canvases. Then he and his assistants draw in the lines and apply the paint. Without the reflectoscope, the paintings would be a life's labor, for with the machine two months' work can be done in four hours.

The canvases were woven in Belgium of the best linen. The largest are forty feet square and the smaller ones, twenty by twelve feet. They are hung through slits in the floor in a four-story studio. About 500 pounds of the best grade of artists' paints are being used.

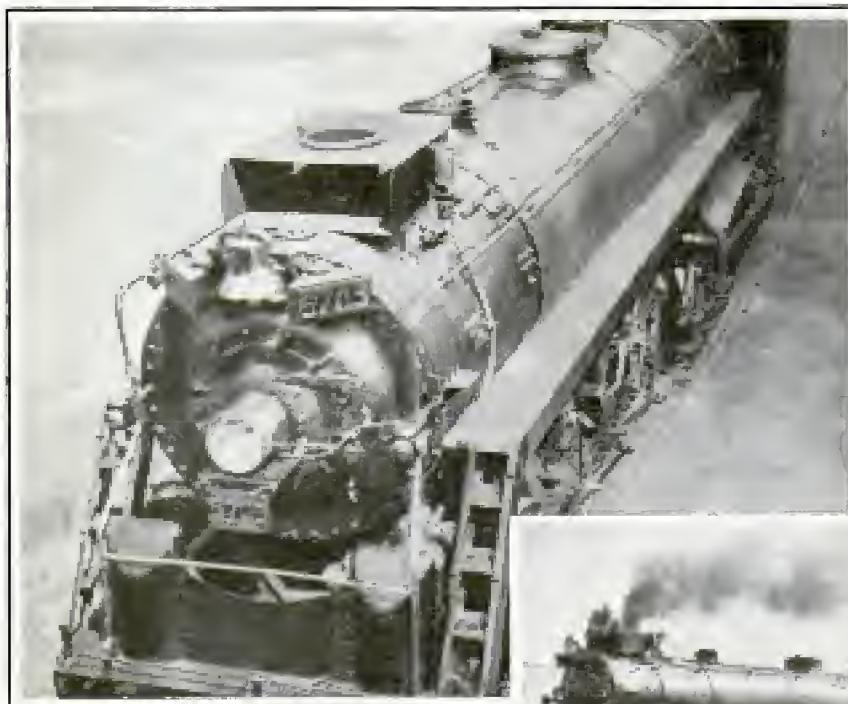


Top, Comparing Original with Enlarged Painting; Below, Painting with Aid of the Reflectoscope

Chas. Beseler Optical Co.
1312 23rd. New York
Copyright material

B. 156 Cmt. Stanley W. Todd, 230 Park Ave
746 POPULAR MECHANICS

Smoke Deflector Helps Crew of Locomotive



Locomotive Stack Equipped with Deflector to Force Smoke and Cinders into Air

Smoke deflectors have been installed on locomotives of the Canadian National railway to improve the visibility for engine crews on fast trains. The deflector is placed about the engine stack, and forces smoke and cinders high into the air by creating a current which shoots upward at the rear of the stack. This not only removes smoke from the vicinity of the cab, but lifts it over the coaches behind.

B



possible for the operator to view the image in the full size it will appear on the developed film. A "shifting rod" is built into the top of the case which is pulled out to place the film in position for exposure, and a knurled knob sets the size of the image desired. The rod is pushed in after each exposure, winding the exposed portion and

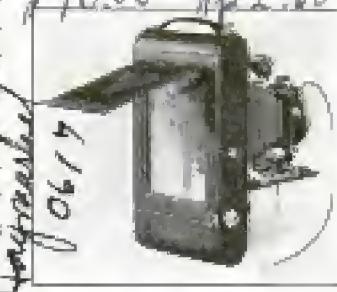
moving all the film into the bottom of the housing to avoid damage by light, when the next view is framed.

BITS OF METAL IN FOOD FOUND BY MAGNETIC DETECTOR

Through the use of a magnetic detector, bits of metal in packages or sacks of food are revealed instantly as the containers pass through the machine. The device is not a magnetic separator, but simply detects magnetic metals in food after they have been packed, its application being confined to products in non-magnetic containers. Its sensitivity is so great that it will detect a piece of iron weighing only one gram (sixteen grains), even though the metal is imbedded in a brass brick. Packages passing through the machine first encounter a magnetic field where the bits of metal are magnetized. Next they are carried into the secondary field in which the presence of a bit of iron is revealed by the deflection of a galvanometer needle, the flashing of an electric light or

NINETEEN VIEWS OF SIX FILMS MADE BY AUTO-CAMERA

Many features of the professional camera, including direct focusing of the image on a ground-glass screen, are available in a folding camera recently developed, that, in addition, makes it possible to take nineteen pictures on a roll of six films. The image is produced in postcard size, or in one-third or two-thirds postcard. The back of the camera opens on a screen, making it



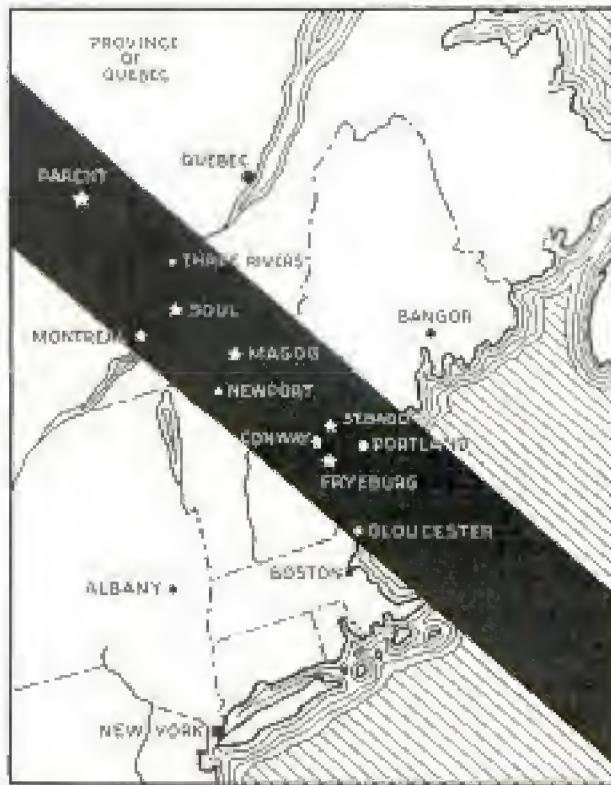
B. 156
Palos Cl. Inc.
817-825 Washington Blvd.
Chicago

Alings Magnetic
Separator Co. Copyrighted material
600 Smith Milwaukee

the ringing of a bell. The conveyor stops on such a signal until the package containing the "tramp iron" is removed from the belt.

ASTRONOMERS TO SEE ECLIPSE IN U. S. AND CANADA

Hundreds of astronomers and students from many institutions all over the world will observe the total eclipse of the sun on August 31. Expeditions will be sent to vantage points in the United States and Canada, the path of the eclipse lying across part of the New England states and the province of Quebec. The shadow will cover all of the Atlantic coast between Salem, Mass., and Boothbay, Me., while the most northerly accessible point of observation will be Parent, Quebec, about 185 miles northwest of Montreal. Most of the observations, if cloudy weather does not interfere, will consist in photographing the solar corona. The corona is the outermost part of the sun, so faint that it is generally invisible because of the great glare from the light of the inner part. Cameras ranging from small kodaks to giant astronomical instruments, eighty-five feet long, will be turned on the eclipse.



Black Band Shows Path of Total Eclipse in Northeastern United States and Canada

Science Service
Feb. 1932



Wet Wool
Spraying Asbestos Wool on the Inside of the London Subway Tubes to Deaden Noise

NOISE OF SUBWAY DEADENED BY ASBESTOS COATING

Tunnels of London subways are rapidly being freed of an undesirable feature—noise. The roar of the tube is being deadened by coating the inside with asbestos wool, applied much in the same fashion as automobiles are painted in America, a cement and the wool both being blown on in one machine operation.

TUBE MOST SENSITIVE TO VOLTS MEASURES HEARTBEAT

So sensitive that it can detect one-tenth of a millionth volt, a new vacuum tube, announced by the General Electric company, is used in a machine which measures heart action. Contraction of the heart muscles is accompanied or preceded by an electrical manifestation. When a muscle contracts, its electric potential or voltage differs from that of a muscle at rest. If two points of the patient's body are connected through a sensitive measuring device, the instrument indicates an electric tension which varies with the heartbeats. The new "low-noise" tube helps record these voltage variations so that analysis of the heart action can be obtained. Low noise, as applied to the tube, means that random disturbances in former tubes, which once masked detection of minute voltages, have been reduced to a minimum.

Is. J. Metcalf and
J. M. Stevenson.
Vacuum tube eng. left.

Meeting of American Physical Society at Cambridge

Rockets Test Kaye Don's Speed-Boat Model



Driven by small rockets, models of the speed boat, which Kaye Don will pilot in attempting to regain for England the world's record, are undergoing strenuous tests. Results of these trials will determine the design of "Miss England III," which Lord Wakefield is building to challenge Gar Wood, American racer. The new boat will be propelled by a 5,000-horsepower motor. The models are types varying from 100 to 125 knots, designed and tested under the direction of Sir John Thornycroft, naval designer.

MOVIE "MIKE" PICKS UP SOUNDS THAT HUMAN EAR MISSES

Sounds that the human ear misses are picked up and recorded by microphones used in making talking pictures. A bell or gong has the same sound to the ear, no



Top, Model of "Miss England III"; Center, One of Rockets Explodes; Bottom, Another Test as Designer Is Looking On

matter where it is struck. But there is a particular spot for striking the bell if the best sound is to be recorded. A bar of steel reacts in the same way. Struck in the middle, it has a note an octave lower than when struck on the end. The microphone picks up all the minute variations of tone in between, variations which are imperceptible. The talkies have been described as audible light. When the door of a recorder is opened, light is heard as a buzz. This is caused by outside light striking the photo-electric cell in the apparatus, producing a set of current vibrations which turn to sound when they pass through the amplifier and loud speaker. Bright

sunlight crackles, while twilight has a softer note. In the sound booth is a meter which gauges sound in terms of electrical current. Wallace Beery's voice has a variation of from twenty to thirty milliamperes, Greta Garbo's has about the same range, while Nora Gregor's voice has one of the highest frequencies measured. It is the business of the mixer in the sound booth to see that all voices register the same volume.

Cmt. John C. Penick
9440 Manzanita St.
Los Angeles, Calif.

Melvin Studios

B-563

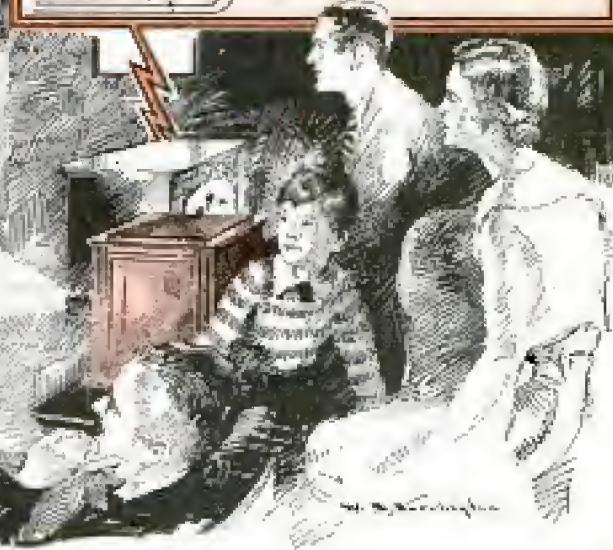
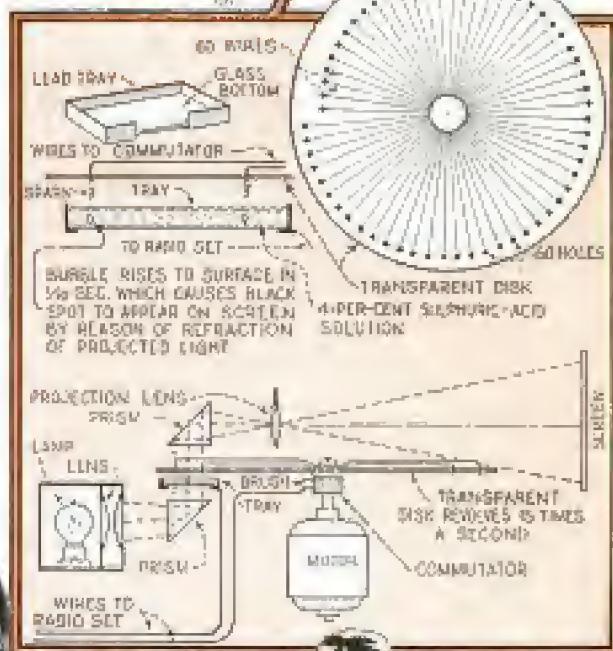
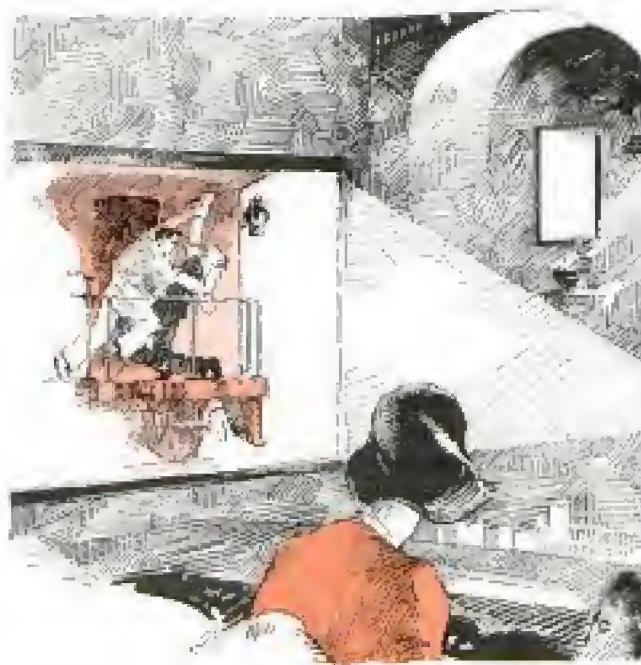
1519 Connecticut Ave
Washington, D.C.

RADIOVISION

to bring WORLD

• • • • to YOU

Radiovision to be shown on a large screen in the theater is a step nearer reality following the invention, in the laboratories of C. Francis Jenkins, of a new type of projector. The new method puts 3,600 times more light on the screen than the old pinhole-scanning system. Instead of being vertical, the transparent scanning disk is flat, and immediately beneath its wire spokes, which go through it where the usual disk has pinholes, there is a glass plate containing a thin film of acid. Incoming television signals cause sparks to jump from the ends of the wires, decompose the acid, and form air bubbles in it. The bubble causes a dark spot to appear on the screen, but it quickly rises to the surface and breaks before another and slightly different image is formed in about one-fifteenth of a second. The projected picture on the screen is exactly like the usual lantern-slide picture except that it has motion. The dots are so blended that they are as inconspicuous on the screen as those of a newspaper illustration.



05-192.

POPULAR MECHANICS

Mrs. Mr. J. W. Beams
and A. J. Weed,
Ansel. of VirginiaBULLET-LIKE SPEEDING CELLS
CAUGHT BY LENS

Wide World
Airplane Pilots Get Wind Directions from This "T," Which Is Lighted at Night

WIND VANE WITH NEON LIGHTS GUIDES FLYERS AT NIGHT

Equipped with neon lights, a wind vane that guides aviators day and night has been installed at a California airport. A giant tee, eighteen feet long, is so marked that it is visible for three miles in daylight, while the lights make it easy to see at a greater distance at night. It is so delicately adjusted that it veers to the direction of a wind of even so slight velocity as three miles an hour.

LIGHT FOR SERVICING BATTERY TAKES POWER FROM CELL

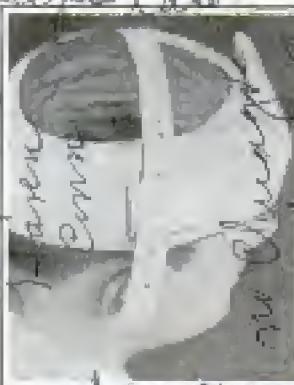
Taking its power from any cell, a light that can be mounted on storage batteries is now on the market. Service and repair work is speeded up by this light, which takes so little current from the battery that anything except a dead cell will light it. The device is clipped onto the battery, leaving both hands free for servicing or repairing.



B-513 While being whirled at terrific speeds, until the centrifugal force is more than 200,000 times gravity, cells, bacteria, and other objects can now be observed through two recently developed scientific instruments. One of these is the centrifuge microscope, and the other the super-centrifuge. The first of these makes it possible for a light to be flashed on the whirling arm at one point in each revolution. Since the centrifuge is turning at so high a speed, the instantaneous flashes thus obtained can be seen through a microscope as a continuous picture, just as in the movies. The new super-centrifuge is a top-shaped vessel with diagonal vanes beneath. It rests in a conical cup with an air inlet at the bottom. When the air is forced into the cup, the rotor is raised slightly and turned by the pressure of the air on the vanes. Rim velocities as high as a third that attained by an express-rifle bullet have been reached, with centrifugal force up to half a million times gravity.

ELASTIC STRAPS RAISE SCALP TO TREAT HAIR ROOTS

Designed to fit the scalp to enable treatment of the roots of the hair, an arrangement of elastic straps is now on the market. The straps stretch the scalp and relieve some



cases of headache, its makers claim.

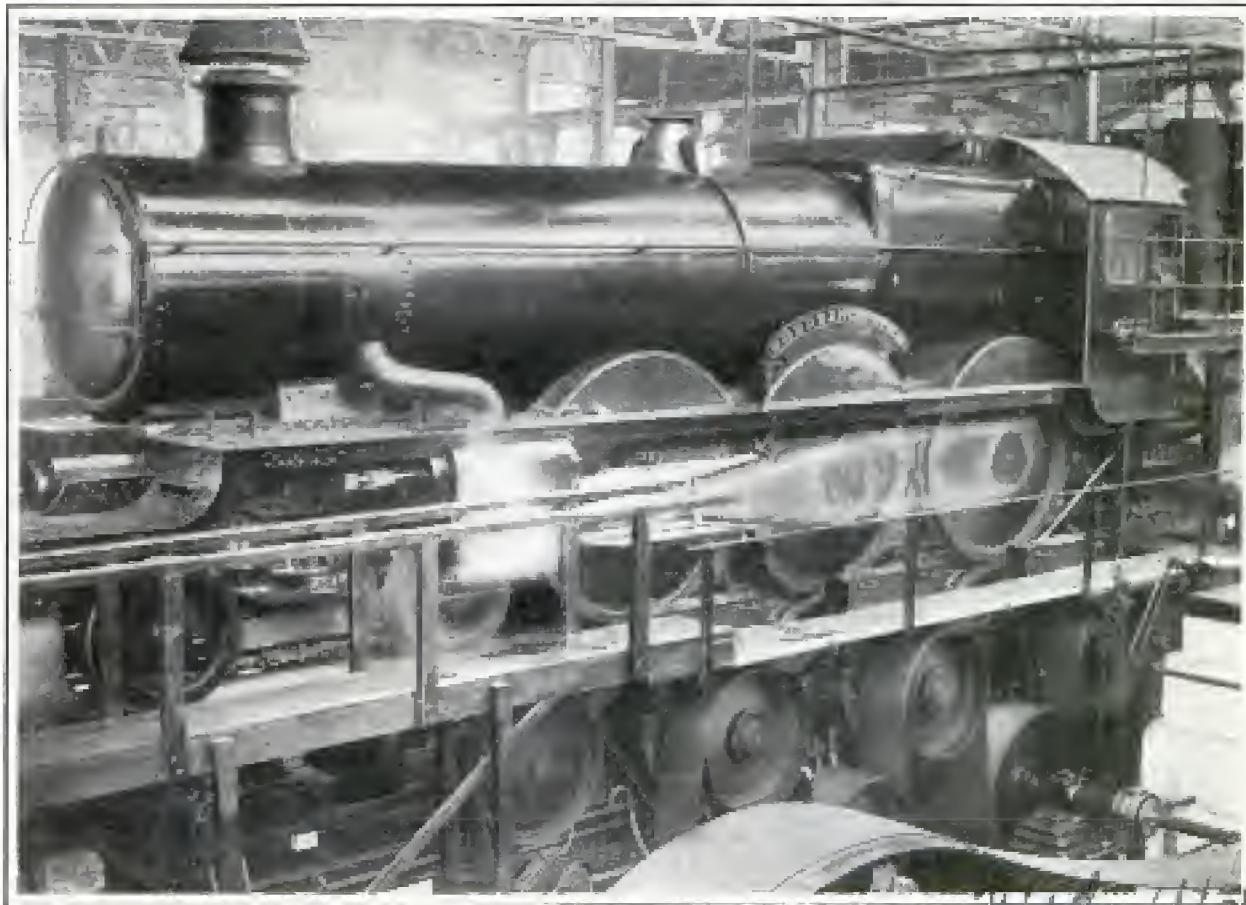
STAINLESS STEEL AND COPPER MAKE SUPER-ALLOY

B-518 Stainless steel has been combined with one per cent of copper in producing what is regarded as a super-alloy. Easier to work and requiring no high-temperature heat treatment for annealing, this alloy has a blue tinge and polishes to a high permanent luster. It can be sheared, punched, perforated, sawed or drilled by ordinary methods, and may be spun, although not so easily as copper.

Associated Alloy Steel Co.
One Cleveland, Ohio.
lighted material

Long Beach Municipal Seal

Standing Still at Eighty-Five Miles an Hour



One of the Many Tests in a British Locomotive Works; This Engine Is Being Throttled Up to Eighty-Five Miles an Hour to Test Efficiency without Moving Forward an Inch on the Treadmill.

Wide World

Great efforts are being put forth in England to speed up passenger and freight rail service, and tests are continually going forward on this end in the Great Western railway's laboratories at Swindon, Wiltshire. One of the most unusual pieces of testing equipment is a huge "treadmill" track on which engines are run up to eighty-five miles an hour without moving a foot forward, to check stability, coal and water consumption and pulling power.

B. 490 DYNAMITE DIGS POST HOLES REDUCING LABOR COSTS

Hundreds of hours of labor are saved by digging holes for telephone or other utility poles with dynamite. The method is particularly effective in sandy, wet soil. A crew able to set eighteen to twenty poles a day in muck or quicksand by other methods can plant sixty-five poles in the same time by blasting. A hole large

enough to hold the butt of the pole is dug. Then a six-foot length of small pipe is set in the hole, and a bar is operated through the pipe, digging a hole into which the pipe sinks. When the required depth is reached, the drill is removed, dynamite is tamped in place through the pipe and the pipe is pulled out. The pole is raised directly over the hole, and the dynamite is discharged, the pole sinking into the hole from which earth and water have been blasted. At times a gas pocket is formed and the ground must be punctured to deflate it. This method was discovered when a South American company failed to loosen a tower pole by pulling and set a dynamite charge at its base. The dynamite made a hole into which the pole sank.

That the age of a stalagmite can be told by its "rings," like a tree's, is the discovery of Carl B. Livingston, scientist and lecturer.

*E. I. du Pont de Nemours Co.
Wilmington Del.*

*see Blasters
Handbook
Copyrighted material
P. 104, 105, 106*

B-406 Mrs. Mr Purves

752

POPULAR MECHANICS
Taunton, England

One-Wheel Auto Carries Passengers in "Tire"



The One-Wheel Auto Rolling Along beside a Car of Ordinary Size; It Has Room for Two Passengers and Can Make a Speed of Thirty Miles an Hour on Smooth Highways.

Resembling huge automobile tires in general appearance, motor-driven cages, ten feet high, recently rolled over the highways in England at thirty miles an hour in the initial tests of a form of vehicle termed the "dynaspHERE." In effect, it is a one-wheel automobile with room for two passengers inside the "tire." The wheel is of metal latticework with a bulging rim like an inflated tire. Inside is a circular track on which rests the set of wheels supporting the driver's seat. These wheels are operated by a small gasoline or electric motor. This power is sufficient to roll the vehicle forward, the passengers remaining always at the bottom. The dynaspHERE can be steered from inside the body by mechanical means, but passengers find it more exciting to lean in the direction of the turn, thus accomplishing the feat in a shorter radius. A canopy over the seat protects the passengers, and the driver looks through the latticework grill of the revolving wheel.

ELECTRIC BULB CURES RICKETS IN FARM ANIMALS

B-512 Farm animals have been treated successfully for rickets by irradiation with ultraviolet light emitted by a special kind of electric lamp. These bulbs contain a glass which allows the ultraviolet light

generated by the filament to pass through, instead of stopping it as is the case with the ordinary lamp used in the home. Used for poultry, the lamps not only cure rickets but increase egg production, promote the rapid growth of young chicks and increase the sunshine vitamin content of egg yolks. Beneficial results have been noted also in treating horses, cattle, pigs, dogs and rabbits. The lamps are available in sixty, 300 and 500-watt sizes, but thus far they have been used only for animals, and not for the treatment of human beings.

B-501

WIRE NET OVER STREET LIGHT PROTECTS GLASS GLOBE

Wire netting has been placed over lamps along a Cincinnati street to protect the globes from breakage, and also to protect pedestrians from flying glass in case an automobile strikes one of the posts. In such an event, the broken glass is confined in the net and does not scatter over the street as usually is the case.



Cont. Roy Icheson

215 Findlay St
Cincinnati, Ohio

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National Lamp Works,
Midland Div., General
Electric Co., 20 N. Wacker
Drive, Chicago

Co-op project
insulated steel floor B-251
and wall C. POPULAR MECHANICS March 253 G

Cameron, Can

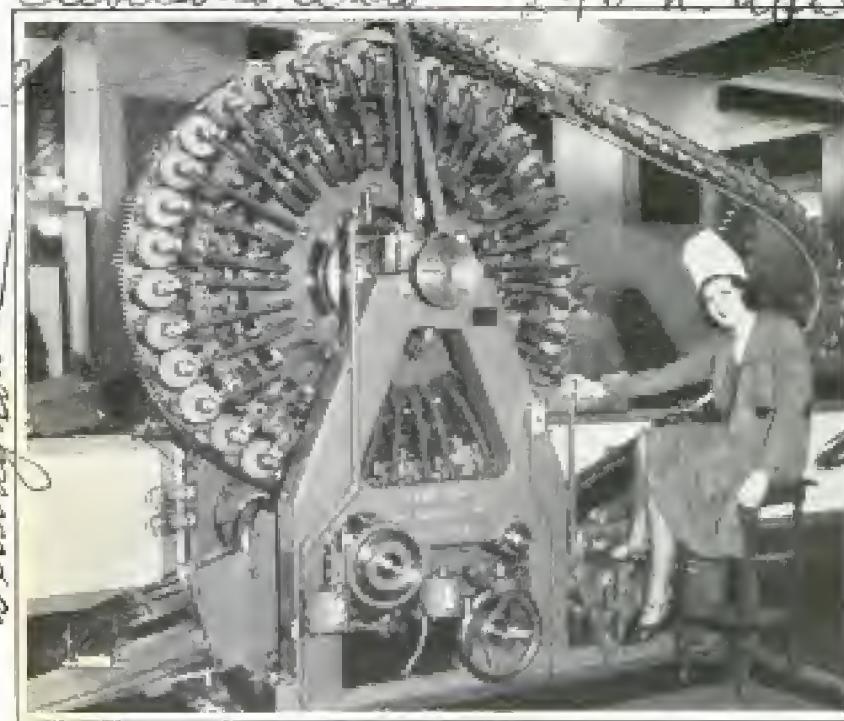
Marked 253 G

Cleveland Ohio 240 N. Highland

are
Chicago

FRAMELESS HOUSE OF STEEL BUILT IN TWO DAYS

Frameless houses of steel, which can be erected in two days, are being built as an experiment to determine the practicability of mass production of homes. The first, located in a Cleveland suburb, consists of steel sheets, welded together and insulated. It has eight rooms, two baths and a two-car garage. The exterior is asbestos sheet while the interior is constructed of an insulation board made of exploded wood fiber. Between the inner and outer walls is a single thickness of steel sheet, formed in flat corrugations. Rock-wool insulation is used to stop circulation of air and prevent corrosion. Floors are of steel, laid in zigzag formation. The house contains approximately fourteen tons of steel, the only wood used being the mantel. Since all parts are fitted and "sleeved" in the making, the sheets can be assembled and welded in two days. Development of new continuous steel-rolling mills makes the project possible.



Tin-Can Tester Which Examines 300 Cans a Minute for Leaks; a Leak Operates a Switch Which Throws Out a Faulty Can

THREE HUNDRED CANS A MINUTE TESTED IN VACUUM

Tin cans containing food products are examined for leaks in an automatic tester that handles 300 containers a minute and ejects the faulty ones. The cans pass into the machine on an endless conveyor and are tested by vacuum, a small air leak in any one operating an electric switch that separates it from the rest.

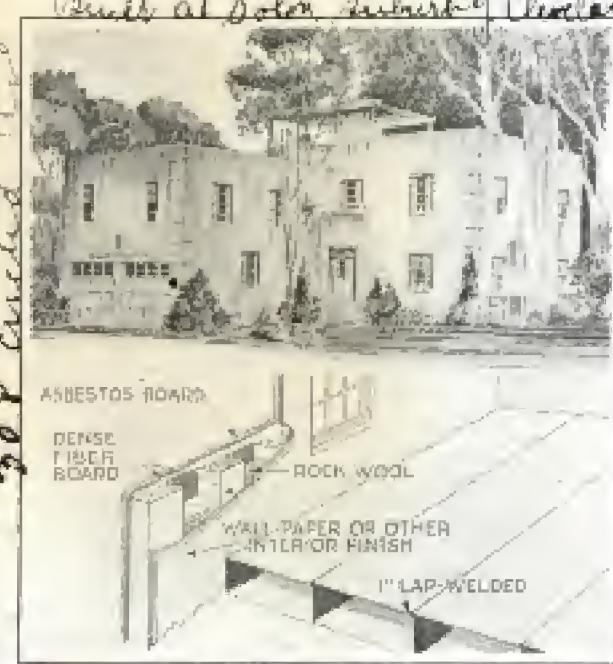
Oct. 234-573

GERMS ARE KILLED BY WATER FILTERED IN SILVER B-39 7

Although it was discovered in the eighties that water kept in a silver or copper vessel acquired certain germ-killing properties, it was only recently that a scientist in Paris found a commercial adaptation for the phenomenon. Silver chloride mixed with potters' clay and baked at a high temperature is employed as a filtering medium, and it has been found that water passing through such a filter has the property of killing typhoid and other germs, while itself containing no silver. Certain previous researches had demonstrated that, if silver is to sterilize effectively, it must have enormous surface. It was therefore converted into minute bubbles, which make it possible to kill all germs in 10,000,000 liters of water.

2/14/32

N.Y. James



This House Is Built of Steel Sheets, without a Frame;
Note Wall and Floor Construction

Developed by Mills
Es. Clark
Cleveland, Ohio

George Lakhovsky
Copyrighted material

B. 315

754

POPULAR MECHANICS

*Allen Electric Equip.
ment Co. 2101 N. Fletcher
St. Kalamazoo
Michigan*



Courtesy Western Electric Co.
Tests of Safety Shoes Include Pounding by Heavy Weights, Heating in Oven
and Soaking in Acid

SAFETY SHOES UNDERGO TESTS TO PROTECT Wearer

Designed to protect their wearer from injury, safety-shoes must undergo severe tests to insure strength sufficient to guard the feet. Factory workers are equipped with such shoes. Weights of several hundred pounds are dropped on the toes of these shoes, while a sixteen-hour bath in acid and a sixteen-hour period in an oven at ninety degrees and high humidity, are other tests.

CANS OPENED BY STEEL WIRE SEALED AROUND COVER

Sealed under the cover, a steel wire for ripping open tin cans has been introduced in the canning industry. This type of opener, claimed by its maker to be the most efficient, must be manufactured into the can. It consists of a steel ripping wire secured in a groove around the underside of the can cover with one end passing to the outside of the cover and formed into a loop. A drop of solder seals the hole through which the wire passes. To open the can, it is necessary only to hold it firmly, insert a nail or tine of a fork through the wire loop and pull straight up. This cuts the cover from the can cleanly without any risk of lacerating the hands.



Double breaker arms in the modern automobile distributor often cause trouble unless they are exactly synchronized so they will fire all cylinders in time. The difficulty of the synchronizing operation has been overcome through the introduction of a precision tool recently placed on the market. The apparatus includes two bulbs so that cars having double ignition, or those equipped with two coils, can be handled. There is a rotating pointer resting above a dial marked in degrees for both six and eight-cylinder engines. The dial is mounted on the distributor block and connected with the distributor shaft. As the pointer turns with the engine, the bulbs indicate the positions at which the particular cylinders are firing, and the points are then adjusted so that the arms synchronize.

B. 378

SUPER-MAGNET WILL ATTRACT NON-MAGNETIC SUBSTANCES

So powerful that it will attract substances ordinarily considered non-magnetic, an electromagnet has been devised for separating valuable from worthless minerals. Slate has been taken from coal in the reclamation of mine scrap and even common sand has been divided into piles of like grains by the magnet. A force twenty times that of an ordinary perma-



*Merchant & Evans Co.
2035 Washington Ave.
Philadelphia, Pa.*

*Reported by Drs.
Drants, Wright and
Princeton*

2/1932 Es W. German, Jr. Pres B-168

~~of the~~ POPULAR MECHANICS
Engineering Corp.
~~31 Monday, March~~

755

ment magnet is exerted against a falling stream of particles, pushing those of greatest magnetic susceptibility beyond a vertical partition. So powerful are the magnets that they separate materials having a magnetic susceptibility of one one-hundred-millionth that of iron. The process can remove faintly iron-stained particles from sands and clays which go into the manufacture of glass and sanitary ware.

B 32

PRUNING SHEARS CUT WITHOUT SMASHING

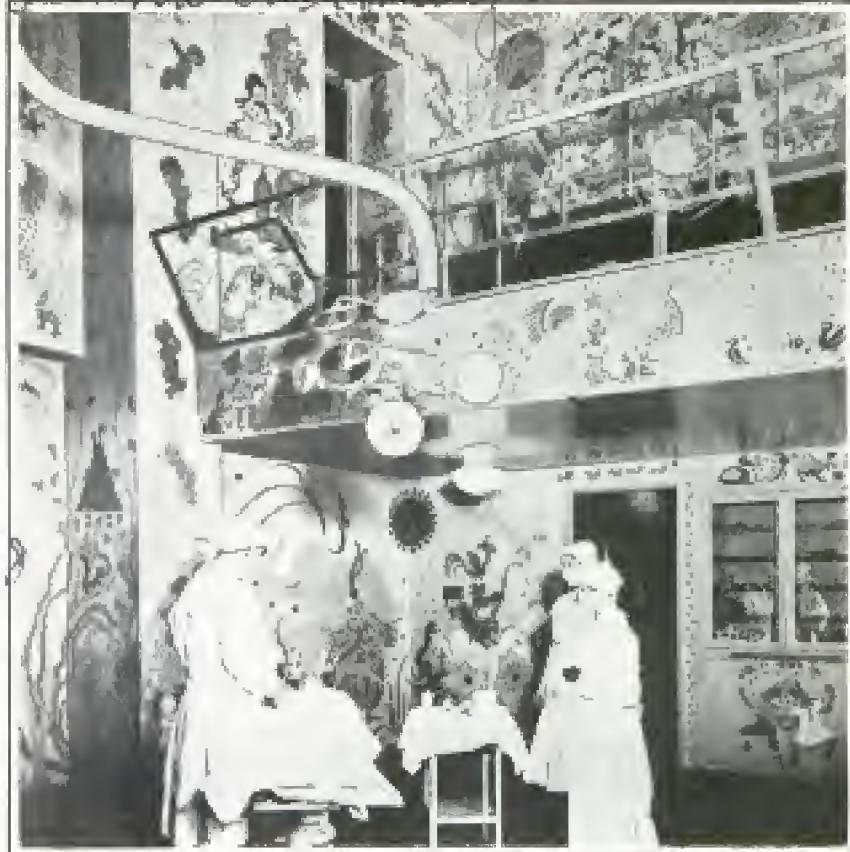
Pruning shears with a thin V-blade that cuts into a soft-metal block have been developed, guaranteed not to pinch the hand of the operator. The construction of the cutting blade is such that the twigs pruned are not left in a mangled condition, but are trimmed sharply. The tool easily handles half-inch seasoned hardwood or three-quarter-inch green branches, and the cutting action is so close that even the twine used for tying vines can be cut with it. A finger guard holds the tool in position where cutting can best be done. The shear weighs ten ounces, is seven and three-fourths inches long and is finished in chromium plate. Handles are all-steel and the blade is of tool steel. A spring washer keeps the tool always in proper adjustment.

Snip-Cut



These Pruning Shears Cannot Pinch the Operator's Hand and Cut Clean without Smashing Branches

Seymour Smith, Jr., Inc.
Oakville, Conn.



Operating Room for Children, in a St. Louis Hospital, with Walls and Ceilings Decorated with Colored Pictures from Fairytales

"FAIRYTALE" OPERATING ROOM APPEALS TO CHILDREN

One St. Louis hospital has an operating room designed particularly for children. There is none of the austerity or glaring whiteness common to such rooms, but instead the walls have been decorated with brilliant scenes portraying popular fairytales. Even the ceilings and cabinets are decorated with pictures, the colors and figures having been found to divert the minds of children from pain or discomfort.

ENERGY EXPENDED IN SPEAKING FOUND OF LITTLE VALUE

If the human race, composed of some 1,500 million persons, were gathered in one place and all shouted at the same time, the total energy, transformed into heat units, would boil just enough water for a cup of tea. This German calculation is designed to show that energy expended in talking is of little value, and that, from a standpoint of kilowatts or horsepower, there is no such thing as too much or too loud speaking.

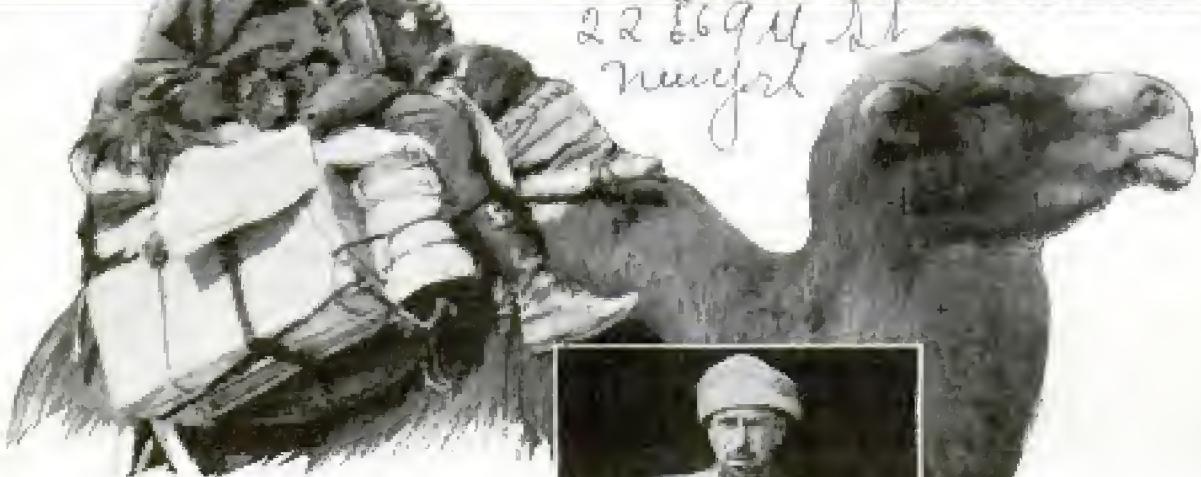
Technic
Jui Alle
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Feb. 1932

This EXPLORATION



BY EMILE C. SCHNURMACHER

22 6694 1
New York



Top, Exploring Ship Headed for Arctic; Above and Right, Gene Lamb, Explorer, Using Camel as Pack Animal and Wearing Native Costume

WITH the increasing use of such modern aids as the wireless, the airplane, the motorboat and the automobile, the business of exploring the four corners of the globe and bringing back scientific data and specimens, is rapidly being removed from the category of hazardous occupations.

Exploration and discovery is a business, and an extremely methodical one. Like every other business, it makes use of the

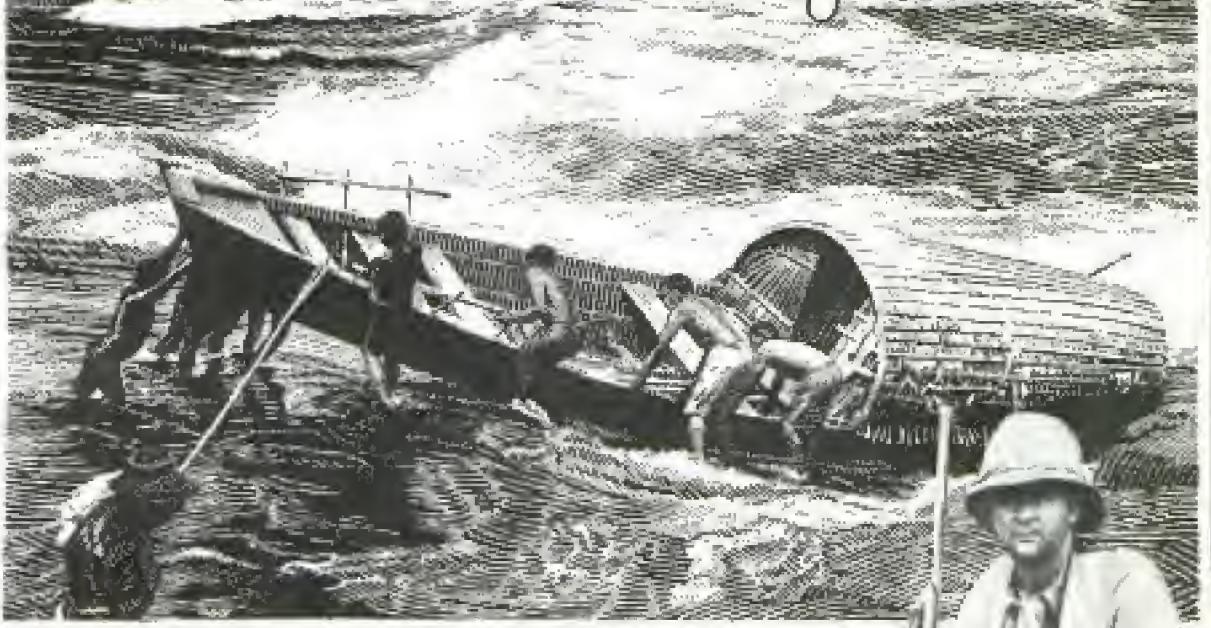


latest in scientific and mechanical equipment to aid in the work at hand.

It is principally on the dangerous one-man expeditions, "gone native" without the latest in scientific accessories, that most of the real adventure now is encountered. Typical of such an

expedition is the recent crossing by Bertram Thomas of the Arabian desert from

BUSINESS!



the Arabian sea to the Persian gulf. Mr. Thomas, with a handful of Arabians, in 1931 crossed and explored an area more than one and a half times as large as France, a sector that had never before been seen by civilized man. He had adventures aplenty in so doing.

He grew a beard and donned Arab costume to cross one of the major unexplored areas of the earth, when he made his way from Dhufar, in southern Arabia to the Katar peninsula, across the arid, trackless Roba-el-Khalil desert.

"But," he told this writer, "it would have been useless for me to venture a step from Dhufar, had I not known one of the hillmen would take me part way. Getting started is the hardest part. Once 'in,' you can be passed from one tribe to another."

The majority of explorers feel that on a well-equipped expedition, adventures, as



Top, Back-Breaking Work along Amazon River; Above, James L. Clark, African Explorer; Left, African Guide of Ex-President Roosevelt.

such, should not happen, that they interfere with the actual work to be done and are only for the romantic-minded. Speaking of cold-climate exploration Vilhjalmur Stefansson, famous northern explorer, said "an adventure is a sign of incompetence. If everything is well managed, if there are no miscalculations or mistakes, the things that happen are only the things you expect, for which you are ready and with which you can therefore deal."



Above, Explorers' Club in New York; Right, Planning the Route for an Exploring Party

Speaking about hot-climate exploration, Harold Noice, who reached the Tariano Indian country in Venezuela, said about the same thing: "Wild Indians and ferocious beasts like the jaguar are only occasional dangers to the explorer. Large animals run away from man unless they are extremely hungry or are attacked. In order to be shot with gun or camera, they must be cleverly and persistently trailed. It is the terrible insect life which constitutes the real jungle terror."

A great many of the most famous expeditions since 1905 have been originated by members of the Explorers' club which, located on Cathedral Parkway, New York City, carries on its roster of 600 male members, the names of practically all the men who have made history in the field of exploration.

Roy Chapman Andrews, president of the club and leader of the recent ten-year expedition of the American Museum of National History to the Gobi desert, is continually bombarded with letters and applications from both men and women who wish to become explorers and go with him into the Gobi. These letters reveal the vast misconception people have of the life of an explorer.

A waiter wrote Mr. Andrews that the exploration party must dine in the style to



desert where sandstorms continued for weeks and where the bandits outnumbered the expedition 300 to one.

As for the actual qualities that may make a successful explorer, Mr. H. E. Anthony, curator of the department of mammals of the American Museum and a veteran explorer himself, stated to the writer: "First of all, we like men in our expeditions who are not too young. Certainly they should be at least in their early twenties. We prefer that they should have made at least one trip to the contemplated exploring ground before.

"They should know the language and customs of the country we visit. Last of all, but equally important, they must be indispensable for one particular accomplishment, as hunter, cook, photographer or similar reason."

If a man wants to go exploring on his

which they had been accustomed, and offered to take his tuxedo along. A butcher was eager to join the expedition as a body guard. And a small boy wished to go along to save the explorer's life as the occasion might arise.

Women, too, are eager to accompany expeditions. One woman writer said that she hoped to find something "occult and stirring" in the Gobi. Another wanted to go as private secretary to Mr. Andrews and create a "home atmosphere" in a

own expedition and has an itinerary that sounds interesting, one of the museums may sanction that expedition providing a member of the staff is taken along. That is one way of breaking into the ranks of explorers.

Typical of this is the Ottley-Anthony Venezuela expedition which got under way in January, 1932. Gilbert Ottley, who has supported museum expeditions to the West Indies and South America before, recently decided that a valuable series of mammals might be collected in Venezuela. He approached the American Museum, and Curator Anthony agreed as to the worth of the project.

Charts and data were secured from the library of the Explorers' club, and the next step was to outfit. Here Maj. Anthony Fiala was called into consultation. Major Fiala, who led the Fiala-Ziegler Arctic expedition in 1903-1905 and was with Theodore Roosevelt on his River-of-Doubt

expedition, now specializes in the fitting out of explorers and expeditions.

Larger expeditions offer more problems and a great deal of preliminary work. Months before Admiral Byrd's trip to the Antarctic to fly over the south pole, his business manager was collecting money for the expedition. Sometimes it is necessary for the explorer himself to raise funds.

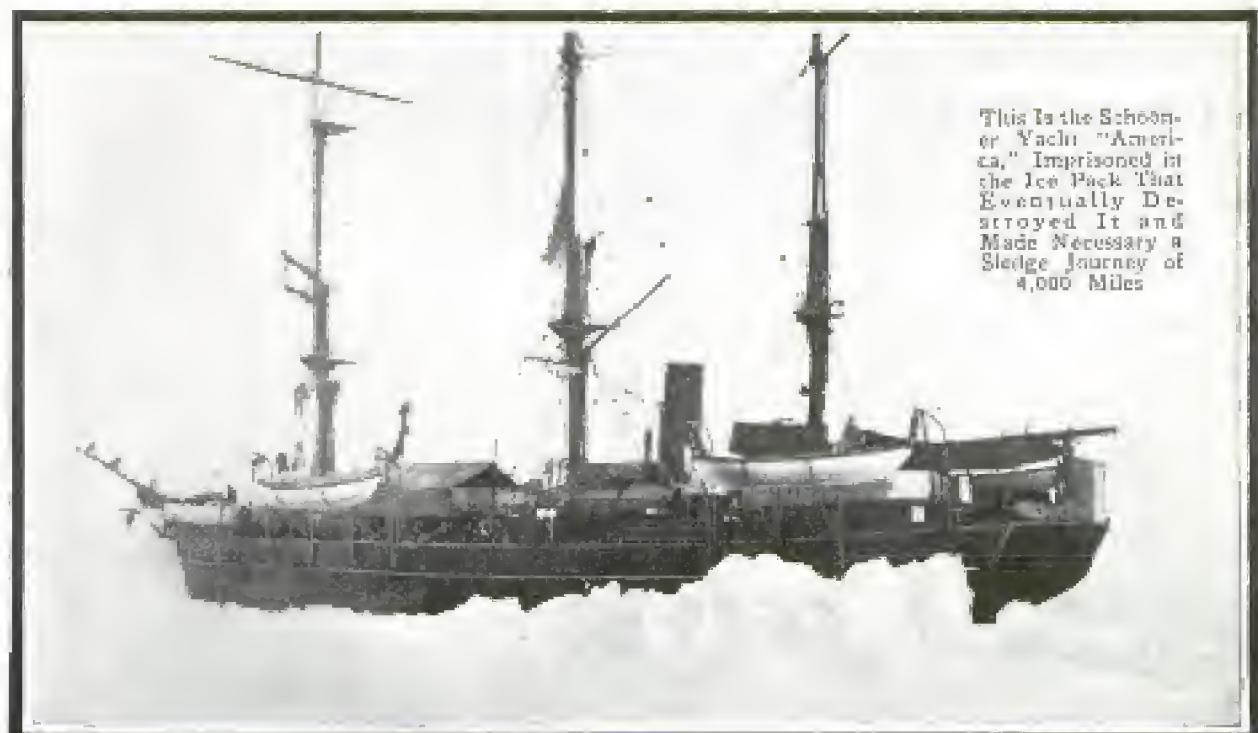
Mr. Andrews personally collected money for the Gobi expeditions from Wall street financiers. "These are the

financiers who, perhaps, have never been outside an office but have engaged in the great adventure of making money," said Mr. Andrews. "Their interest was attested in their subscriptions. A map was the only accessory needed in talking to them."

Some of the most successful expeditions are those which never become known to the general public. These are exploration parties of engineers sent out by big com-



One of the Successive Steps in the Transportation of an Expedition into Venezuela



This Is the Schooner Yacht "America," Imprisoned in the Ice Pack That Eventually Destroyed It and Made Necessary a Sledge Journey of 4,000 Miles



panies interested in the discovery of oil and minerals. Frey Broberg, one of the best known of these engineers, has explored parts of Asia and South America in the course of his business which would arouse columns of newspaper publicity if accomplished by a "typecrasher."

A typecrasher is a pseudo explorer who engages a competent press agent to exploit his expedition and keep it on the front page of the newspapers. Just as there are rackets in nearly every business, so, too, the exploring business has the typecrasher. He is harmless enough, insofar as getting personal glory and lucrative lecture bookings on his return are concerned. Where the danger does come in, however, is that he sometimes leads trusting photographers and others members of his expedition into situations with which he cannot cope and which may take the lives of his party as well as his own.

In paving the way for the explorations made by the leaders of the expedition, minor members often perform great deeds of bravery and have stirring adventures which pass unobserved by the public.



Above, Explorers in Chinese Turkestan; Below, the Living Buddha of Tibet, Interviewed by Gene Lamb

One hears of such famous feats as Admiral Byrd's flight over the south pole, yet little has been said of the real adventure of Dr. Laurence McKinley Gould, who sledged 1,500 miles across the Antarctic wastes on skis with dog teams to the Queen Maud mountains within a short distance of the south pole, to lay down a series of caches for Byrd in case his plane was downed. It was on this sledging journey that Gould discovered, in a kerosene can in a cairn, the note left by Amundsen, recording the discovery of that country in 1911.

Even in such a comparatively small expedition as the Parker Brown first ascent of

Mt. McKinley, the real adventure befell the cameraman Merl La Voy who spent weeks climbing a neighboring peak in order to photograph the expedition's climb.

One of the most consistent performers of the "minors" is Capt. Bob Bartlett who guided Admiral Peary's ship on the voyage of discovery to the north pole, and who has been active in polar exploration work ever since, recently returning from the Arctic with the Harold McCracken party.



Dog Teams and Sleds Constitute the Favorite Mode of Travel for Explorers in the Arctic and Antarctic; the Dogs Can Stand the Cold and Make Good Time Over Ice and Snow

Among the members of the Explorers' club, who go out on small "gone-native" expeditions and consequently have their full share of adventure, are Harold Noice and Gene Lamb. The former is a South American explorer and the latter favors Tibet and Mongolia.

Both of them relate little experiences of theirs which prove that sheer "hoss" sense is one of the most effective assets of an explorer, and that by using it he can extricate himself from dangerous situations.

"My half-breed guide, Jesus Lionel," said Mr. Noice, "warned me that we might have serious trouble with the Indians who were particularly hostile toward white men. After we reached the Tariano country, he called me early one morning, appearing shocked and frightened. When I demanded what had happened, he asked me to come and see for myself.

"I saw the remains of what had once been two traders, now stripped and decapitated. Their heads had been neatly removed with some sharp instrument and possibly carried away as ghastly souvenirs to a hidden jungle retreat. There they lay, a gruesome find for me, their successor, to come upon the following week, but a

warning that the white man must not offend the Indians.

"Later I allowed the astonishment of my arrival and distribution of presents I had brought with me to subside, before opening the box containing my motion-picture camera. Then, one day, I unloosened the legs of the tripod, stretched them to full length and mounted the camera upon it. The Indians exchanged frightened looks. Some ran away, but I laughed and talked with Jesus Lionel during the operation and this partly allayed their fears. Then I inserted the crank at the side of the camera and gave it a few turns. The Indians backed away like scared children. When they saw that the camera did no harm, they crept back."

Had Mr. Noice mounted his camera immediately on his arrival among the Tariano Indians, he probably would have been killed as were the traders. As it was, they considered



Capt. Bob Bartlett, Commander of Admiral Peary's Schooner, Making Friends with an Eskimo

him a magician because he had a black satin and rubber bag (for loading and changing film) over his hands and arms, and one day when a swarm of hornets descended upon him, he continued to work furiously with his hands in the bag while the Indians ran to the river and jumped



Permitting Natives to Inspect "Devil Box" to Show Them It Is Harmless

in. "The result was that I preserved the film, but I walked around the camp like a poisoned pup for the next few days, an object of amazement and pity," said Mr. Noice.

Gene Lamb, the first white man to gaze upon the face of the Panchen Rinpoche of Tahsilumpo, the reincarnation of Buddha, by using common sense escaped from bandits who descended upon his Trans-Asia Photo Scientific expedition in northern Tibet. These bandits are different from the land pirates of other countries. They have their own pleasant technique for handling foreign travelers who yell and pay ransom and missionaries who threaten them with divine wrath.

"Our expedition fell into the hands of the bandits as we were returning from Tibet, five days out from the railroad," said Mr. Lamb. "Suddenly three armed men appeared in the road ahead, two in old uniforms, one in native dress, all mounted on horses. My mind went back over the perils and persuasions of two years past. All for the sake of Mongol cutthroats."

"Where did you come from?" they be-

gan, "Where are you going?"

"From Hsi Tsang," I said, pointing toward Tibet, "and to the railroad.

"One of the bandits advised me not to do it, that there were robbers ahead. I went ahead, however, and they came along. At the next village there were several hundred of them dismounted and waiting. Their captain asked me what I had. 'Mei yu ch'ien,' I answered, which means 'I have no money.'

"They delved into the tin boxes of undeveloped film and split a dozen rolls before I convinced them that the rest were not worth opening. They were accustomed to seeing opium in tins of that sort.

"The captain wanted me to go with him to the telegraph line and send to the American legation at Peiping for ransom money. I told him that they knew me too well there and wouldn't pay to have me back.

"They saw it wasn't any use killing me as they might have all our goods without going to that trouble. They saw my tool kit and brought out old guns and I improvised sights for them. I invited their captain for lunch. 'Everything's yours as long as it lasts,' I told him. 'As you see I'm going to run out of food in a week. But that's all right. I like your food just as well.'

"'All right,' said the harassed captain, 'you can go.'

"'Oh, no!' I told him, 'I've decided to stay. I like you!'

"'Oh no, you don't,' he said, asserting his authority. 'You go your way and we'll go ours. It is better so.'

"And so we compromised. I agreed to accept our freedom and the captain agreed to give us an escort of three bandits to the railroad to ward off further interference."

This display of common sense is neces-

sary in all other phases of exploration work. Said Vilhjalmur Stefansson, in commenting upon it:

"The belief in the danger of going to sleep out of doors in cold weather flourishes even today and even in the schools side by side with opposite teaching. The same man who knows from experience that a chill wakes



Top, Flag of the Explorers' Club Carried by Expedition; Below, Harold McCracken, Who Has Led Many Parties

you up in a bedroom believes also that a chill would put you to sleep under other conditions, this reversal of natural law taking place only when you are lost somewhere, preferably in a snow storm and best of all in the Arctic."

Mr. Stefansson's common sense told him that sleeping in the snow was safe. He did it and felt refreshed. He had been warned countless times not to eat snow. He remembered that ice-cream soda at fountains had not killed him. And so he ate small quantities of snow throughout the day on his expeditions with no ill effects. He was told many times that if a nose was frozen, it should be rubbed in snow. But, "according to the physics course you ought to bring a warmer body near the cold one if you want the cold one

to grow warmer. The only warm thing you are always sure of having with you at the time of a frost-bite is the rest of your body. So you naturally apply your hand to your face. The hand is not necessarily the warmest part of your body, but it is peculiarly well situated for applying to the face and usually it is quite enough."

Thus, Mr. Stefansson and other noted explorers not only give the lie to many popular fallacies, but by doing so, provide for their own comfort and safety.

During the past few years exploration in some countries has been hindered by political or local interests. In Mexico, for example, the government has forbidden relics of historical value to be removed from the country, and at least one explorer has unwittingly found himself in the position of a smuggler in bringing hard-won relics across the border.

In China, too, the ten-year program of exploration in the Gobi desert, headed by Roy Chapman Andrews, was stopped in 1928 by the Cultural society of Peking which seized the field collection at Kalgan, although the expedition was authorized by the Peking government.

Thus, in two countries at least, the explorer has taken on the role of scientific bootlegger. For other explorers, however, there still remain new and not prohibited worlds to conquer.

B 324 Cont. H. J. Wilkins Esq
764 Colomberie 2nd Dean Road
Derby Dead n. Indo Eng
POPULAR MECHANICS

"All Hands on Deck!" in the Menagerie Ship



© E. L. Syed

Those who crave excitement are likely to find it aboard a menagerie ship, loaded with wild animals, birds and reptiles consigned to circuses and zoos. Sometimes during a storm the crates are smashed and the hold is soon filled with roaring, screaming beasts of the jungle. The crew then is faced with the task of driving these animals back to their cages, and often they spend days rounding up bears, pythons, monkeys, tigers and lions. On one such vessel, last year, two irksome brown bears got loose and actually went about freeing other captives, until the ship was alive with roaming jungle creatures. The bears were coaxed back to their cages with a piece of meat, and a huge python went



Top, Trussed-Up Tiger Being Brought Ashore by Indian Natives; Below, Lifting a Protesting Elephant Aboard an Ocean Liner

back of his own accord when he became seasick. A hyena was caught in a sack and three panthers were captured when members of the crew climbed the rigging and dropped tarpaulins and nets over their heads while others held them at bay in a corner. A monkey almost wrecked the ship. He chopped the cook's galley to pieces with a meat cleaver, got into the chart room, damaged a sextant and tore up maps, but finally took refuge in the rigging, where he bombarded the crew with blocks of wood. An engineer stunned him with a blow



© London Daily Mail

of the fist after climbing up to his perch. The most feared animal on shipboard is the orang-utan. A cobra and an orang freed themselves simultaneously in a menagerie ship proceeding from Dutch Borneo to London. The ape descended to the engine room and drove out the entire force despite their assaults with hammers and spanners. He was finally laid out by a fireman who threw a hammer which

03-167

struck him behind the ear. The snake crawled into the forecastle, but was driven out by revolver shots and finally plunged overboard and was lost. Sometimes the less vicious beasts and birds are released and allowed to wander the decks. Like humans, they are subject to seasickness, and lions, bears and panthers often will refuse to eat for days on this account. Large, vicious animals are confined in the hold in narrow cages so they cannot break their legs in a rough sea. Elephants and camels are kept on the top deck except in bad weather when they are held in stalls in the hold. Giraffes are always a problem aboard ship because they cannot stand up, but must be forced to lie down with necks and legs outstretched.

03-368

ELECTRIC CLOCK WITH NO DIAL WORKS LIKE SCOREBOARD

Instead of a dial with hands to mark the time, a new electric clock has made its appearance in Holland with the time printed on plates, operating like a scoreboard. There are twelve hour plates and fifty-nine minute indicators. As the minutes pass, the plates drop down, showing the next one. When the minute plates have all fallen, another hour plate drops and the minute cycle is repeated.

03-369



Big Clock before Mounting on Building; Time Is Printed on Plates Like a Scoreboard

Powerful Magnet Used to Draw Slivers of Metal from the Eyes



BIG EYE MAGNET EXERTS PULL OF TEN HORSEPOWER

Powerful enough to drag a flatiron across the floor toward it, a 700-pound eye magnet has been installed in a Minneapolis hospital. It is used to draw tiny slivers of metal from the eyes and will stop a watch brought into the same room with it and cause the timepiece to fly from the owner's pocket. The instrument has a pull of ten horsepower and contains more than 7,000 feet of wire. Ordinary eye magnets usually are small and weigh only seven or eight pounds.

FAST-GROWING POPLAR TREES URGED AS FARM CROP

Fast-growing poplar trees as a long-time farm crop are recommended by Prof. Ralph H. McKee, of Columbia University. In a radio talk, he said that several new varieties of Carolina poplars have been produced as a result of hybridizing experiments. These trees grow more rapidly than any variety now used for pulpwood or lumber, producing an eight-inch trunk in ten years, half the time ordinarily necessary. During the favorable growing season of 1931, four of Professor McKee's specimens added nine and one-half feet to their height. The quality of wood is equal to, or better than, that of the wild poplar. Considering tax exemptions granted by most states on lands under reforestation, it would pay farmers to put part of their land into these trees, he said.

Science Service 2/13/34
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B-2 79 Western Tire Cure

766 Vulcograph, Inc., MECHANICS

274 Long Beach Ave

Operator with Air
Wrench Can Handle
Five Times as
Many Tire Molds
in a Day

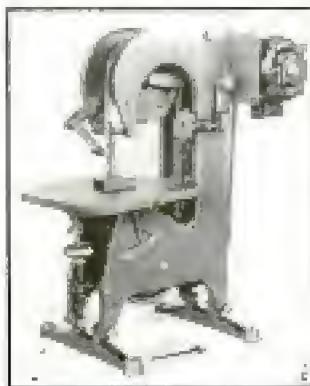


AIR WRENCH FOR TIRE MOLEDS CUTS TIME TO FIFTH

Through the employment of a newly developed air wrench in place of hand labor, the work of tightening clamp screws on molds for curing, or baking, a tire during the retreading process, is performed in one-fifth the time previously required. Besides reducing the time, the wrench provides more pressure per screw and keeps the pressure always uniform at all hours of the day and all seasons of the year, regardless of the ability of the workers.

ONE OPERATOR REPLACES TEN WITH BAND FILER

External or internal filing of small and medium-sized work that requires fitting or forming, is carried out so speedily and efficiently by a continuous-type band file recently produced that one operator with the machine now can do the work of ten workers by hand. Deep, flat surfaces, up to



four inches high, can be finished to close tolerances, and the apparatus is particularly adaptable to tool and die making for this reason. The main driving belt is held under automatic tension, the table can be positively adjusted, three filing speeds are provided and the band files provide a continuous cutting action. As pressure on the files increases, tension of the drive belt becomes greater, making possible a constant, smooth drive, necessary in close-tolerance work. The machine is driven by a one-fourth-horsepower electric motor.

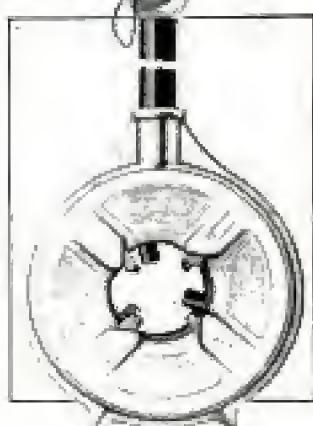
B-396 CURE FOR RICKETS DEVELOPED BY CHEMISTS

Made from synthetic organic peroxides, a cure for rickets has been developed by Prof. John W. M. Bunker, of the Massachusetts Institute of Technology. The new compounds, which can be prepared in any laboratory from a variety of chemicals, contain no oils and have no relation to ultraviolet light, the two most common cures. Such materials as camphor, succinic acid or lauric acid from butter may be used in their preparation. Rickets is a disease which weakens the bones of children and growing animals.

FOUR SIZES OF PIPE THREADED WITH A SINGLE TOOL

B-271 Threaded

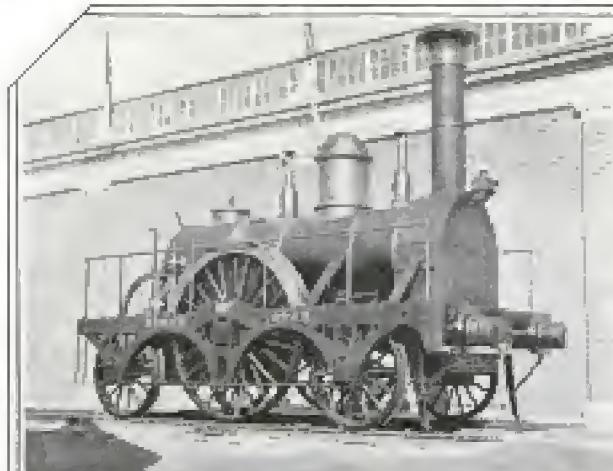
Four sizes of pipe are threaded by a single die stock recently placed on the market. No adjustments are necessary; all the operator has to do is to push down a spring catch and move the post under the hole opposite the size indicated. The stock handles pipe one inch, one and a quarter, one and a half and two inches in diameter with the same set of chasers and will cut under and oversize, drip threads and short nipples, in iron, cast iron, steel or brass pipe. A thumb lever opens the chasers for backing off and at the same time reverses the ratchet.



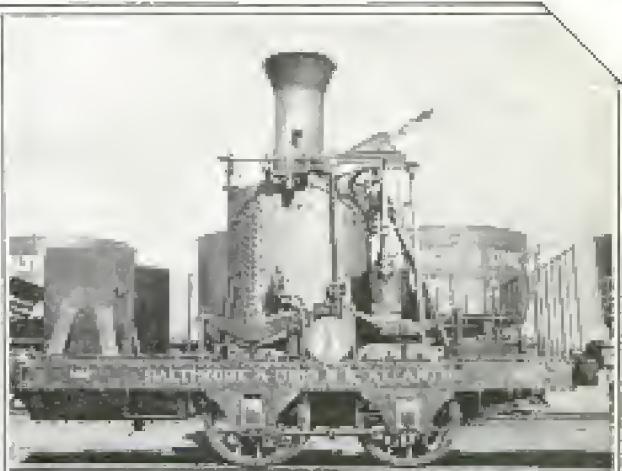
Isrob Bros. Box 65,
West Allis, Wis.

The Judge Tool
Co. Elyria, Ohio
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Early Wonders in Evolution of Locomotive



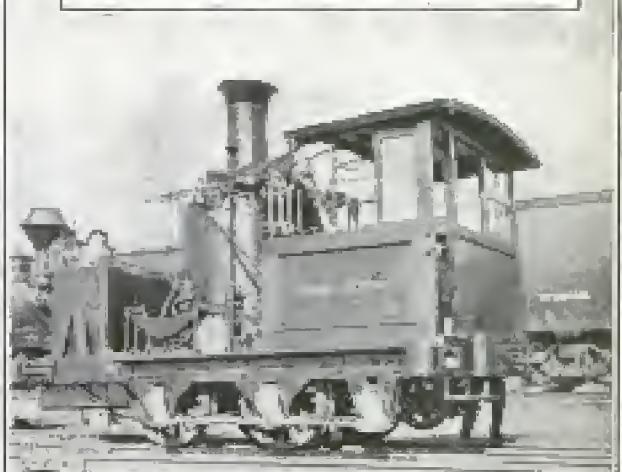
The "North Star," Built in 1837. One of First Engines on Great Western Railway of England; Its Drivewheels Were Eighty-Four Inches in Diameter



The "Atlantic," Built in 1832; This Century-Old Locomotive Had Vertical Boiler and Cylinders; It Ran under Its Own Power as Late as 1927



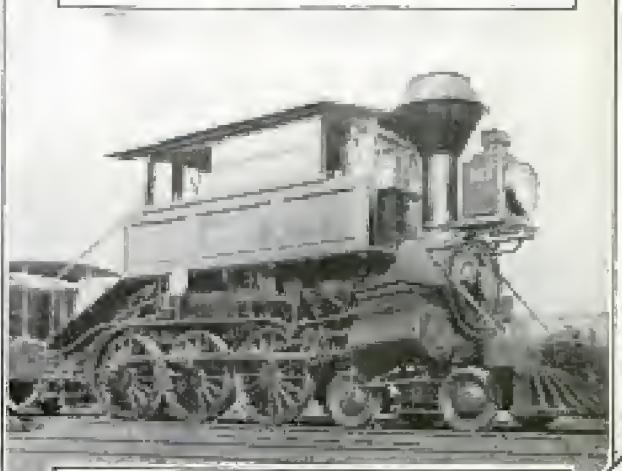
This Engine Was Built in 1837; It Was the First Locomotive to Use a Horizontal Boiler on the Baltimore and Ohio Railroad, and Was First Freight Engine



The "Thomas Jefferson," Another Early Type of Locomotive; It Was One of the First to Provide a Cab as Protection for the Engineer



The Reading "Rocket," Built in 1838 in England for the Reading Railroad; It Was Retired in 1879 after Having Run More Than 210,000 Miles



An Early Type of Locomotive with the Cab Piled on Top of the Boiler and Extending the Full Length of Its Straight Portion



Rubber-Pigment Paints, Used in Mosaics on This Mexican Convent, Have Retained Their Brilliance through Three Centuries

PAINTS WITH RUBBER PIGMENT USED CENTURIES AGO

Paints with pigment, or coloring matter, containing rubber were used centuries ago. During a recent visit to Mexico City, the German geologist, Bahuman, found that such paints were used for the mosaics covering the dome of the Carmen convent, Convento del Carmen, which was built in 1586. Today, these mosaics have an unusual brilliance which the geologist attributed to the rubber pigment. The convent is located near Mexico City.

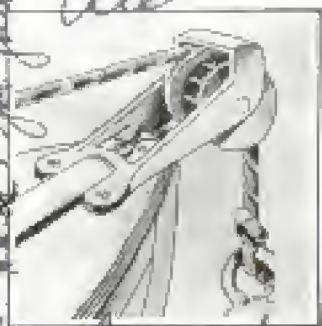
PERFUME TO PUT YOU ASLEEP FOR OPERATION FORESEEN

B-371 New anesthetics compounded of synthetic perfumes, which will give the patient pleasant subconscious sensations be-

sides making the soporific "easier to take," were predicted recently by a Columbia University scientist. More complete understanding of the relations between odor and chemical composition will throw a flood of additional light on chemical structures and the physiological effects of drugs, this chemist believes. He pointed out that a study of certain violet perfumes has recently led to the discovery of the chemical composition of vitamin A. He showed further that parasites and insects that prey on man locate their victims by odor rather than sight and explained several "lures" by which science now draws many of these pests to their destruction.

SAFETY IN BOAT GAINED BY LIFT FOR ANCHOR

To reduce the number of drownings of persons who fall from boats while trying to lower or lift the anchor, a lift has been developed that can be operated from any part of the boat. It is not necessary to move from the seat, lean over the side of the boat, or even to stand up. The lift works efficiently on any kind of boat and with all sizes of rope, sash cord or boat chain up to half an inch. When locked, it cannot slip, and it is said no amount of hard use or wear can weaken the power of its grip. There are no levers, shifts, gears or ratchets to wear out or slip. The lift comes in two models, one to lower or lift the anchor over the bow and the other over the side near the bow.



northern Equipment +
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D. Minneapolis, Minn

LIFE OF FISHING NETS
MAY BE DOUBLED
BY TREATMENT

2/26/44
Press memo
Chemical treatment will lengthen the life of fishing nets to about double that of untreated nets, experiments by the bureau of fisheries of the department of commerce have revealed. Toxic dyes used in manufacturing the cotton thread and a special coal tar applied to the web have been found effective. Chemicals may be added to the coal tar to meet requirements of individual installations. Heavy fish nets, such as traps, pounds and seines, now give an average service of one and one-half years, but this period can be lengthened materially by the new treatment. In some operations, a chemical treatment of gillnets is beneficial. Increased service may be obtained from gillnets which are cleaned immediately after removal of fish and then hung in a well-ventilated shaded place.

TEN GUNS ON AIRPLANE GIVE
SHOTGUN EFFECT

A machine gun so light in weight that ten may be mounted on the wings of an airplane has been announced by John

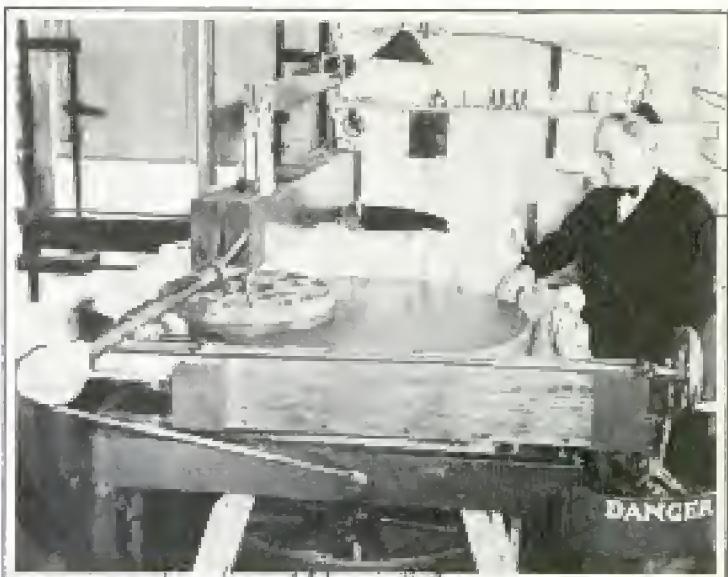


Ten of These Guns Can Be Mounted on Airplane Wings, Firing Like a Shotgun

Order Etch
Browning. The new weapon can fire 1,200 bullets per minute. Equipped with ten such guns, pilots of fighting planes can turn a stream of 12,000 bullets per minute on an enemy aircraft. The "shotgun" effect is the result of the ten guns firing simultaneously, and exact accuracy is unnecessary, since the battery covers such a wide field. The new gun is designated as the .30-caliber aircraft model.

A new transparent wrapping material is being made from cotton.

Kodafilm
Eastman Kodak Co.
Rochester, N.Y.



Forty-Inch Mirror in the Making; It Will Make Naval Observatory Telescope One of the World's Most Powerful

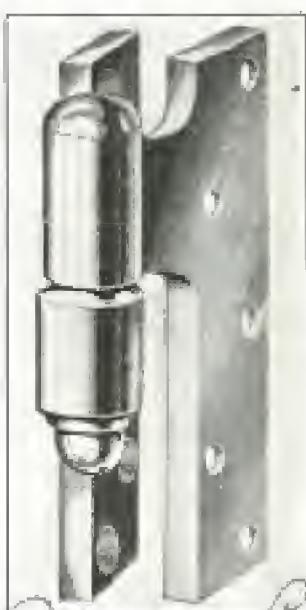
MIRROR FOR GIANT TELESCOPE
IS FORTY INCHES ACROSS

Designed for a photographic telescope to be installed in the Naval observatory, Washington, D. C., a mirror forty inches in diameter has been made. The telescope will have a range of approximately ten million light years, each representing over 63,000 times the distance from the earth to the sun, and will be one of the world's most powerful instruments.

DOOR HINGE ON BALL BEARINGS
IS EASY TO ADJUST

B-455

Door hinges set on ball bearings not only allow the door to swing more freely but make adjustments easier. It is not necessary to remove the door to raise or lower it in adjusting the swing. This is done by removing the slotted cap of the hinge and turning the support in the desired direction with a screwdriver. In this manner a dragging door can be adjusted in a very few moments' time.



Oscar Dixon Co.
4450 Carroll Ave
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Chicago

Charles W. Dutcher
Co. - member



Aerial Photograph Taken from Altitude of 21,000 Feet, Showing San Francisco in Foreground and Mount Shasta and Other Peaks in Distance

EYE OF CAMERA IN PLANE SEES OVER TWO HUNDRED MILES

From an altitude of 21,000 feet, an aerial photograph was made recently which covers 250 miles of territory. The picture was taken from a point ten miles south of the Golden Gate, and shows both San Francisco and Mount Shasta, which are 250 miles apart. It was made by army air-corps photographers who utilized the invisible infra-red light through a special filter. San Francisco is plainly visible in the foreground, while in the distance both Mount Shasta and Mount Lassen may be seen.

METAL CORROSION COSTS U. S. \$1 BILLION DOLLARS A YEAR

B3 Metal corrosion is costing the United States more than one billion dollars annually. Dr. Gustav Egloff, in reporting on protection methods, says that the 1931 corrosion bill of the petroleum industry, with which he is affiliated, is estimated at \$125,000,000, or equal to a one-cent levy on every gallon of gasoline consumed by the nation. Alloy steels containing chromium, silicon, nickel, copper or tungsten,

coatings of metal or ceramic materials, paints and bituminous coverings are a few remedies which have been used with some success. In dealing with the oil industry, Doctor Egloff pointed out that before crude petroleum has been brought from underground, it has brought water or brine corrosion into the wells and pipe lines. Plants for treating distillate oils are subject to corrosion by chemicals used for such treatment. Sulphur compounds in many crude oils wreak havoc in passing through oil casing, tubing, storage tanks, stills and cracking and treating equipment. Tanks, derricks and refinery buildings and equipment

have their lives shortened by atmospheric corrosion, while oil tankers are subject to marine corrosion. Almost one-half of the corrosion waste of the world occurs in this country, Doctor Egloff says.

PULLEY HAS VACUUM-CUP GRIP TO STOP BELT SLIPPAGE

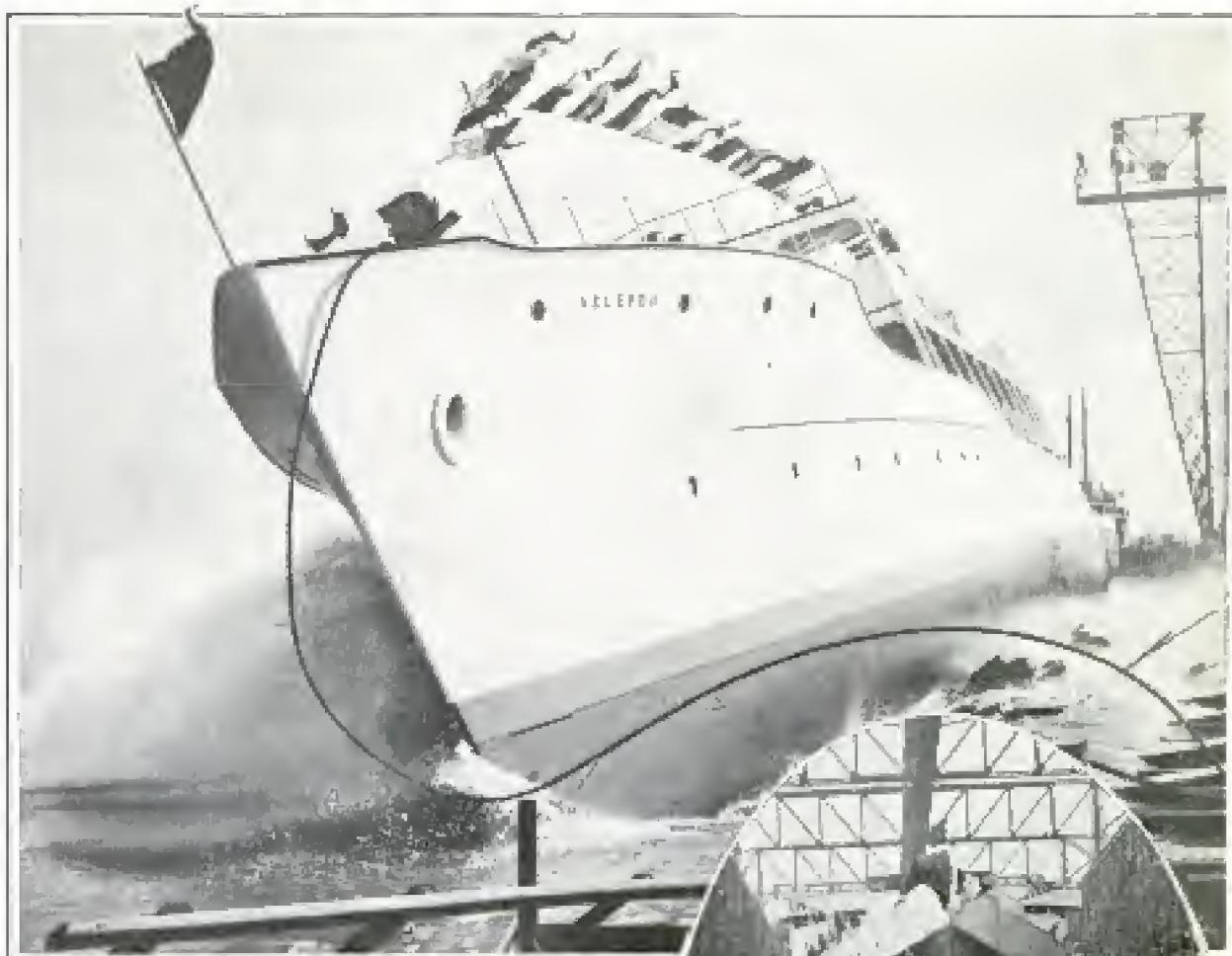
B46 Studded with vacuum cups set into its surface, a metal pulley that grips a moving belt and reduces slippage is now on the market. The vacuum created by cups scientifically designed and spaced over the face of the pulley holds the belt and pulley close together. As the belt reaches the cups, the air is forced out to create a vacuum.



send Reduction in power costs and decreased overhead are savings claimed by the manufacturers in stopping belt slippage.

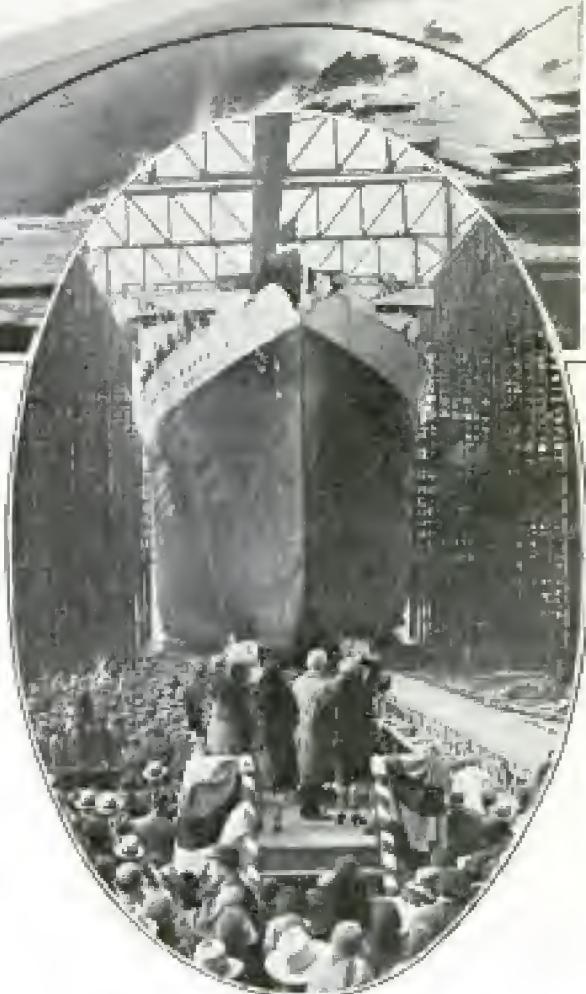
B4 Universal Oil Products Keystone Engineering Co. Chicago 85th Street Macquarie Building, New York, N.Y.

When a Ship Wets Her Nose for First Time



Top, Launching a 1,000-Ton Steel Yacht Sidewise; Right, Endwise Launching of a Large Vessel

Launching a ship, or "wetting her nose" for the first time, is accomplished in a variety of ways. Regardless of how she goes into the water, there is always something impressive and spectacular about it. The majority of vessels are launched endwise as less room is required. When vessels are built for sidewise launching, all construction work is carried on while the hull is in a natural horizontal position. It is claimed for sidewise launching that less strain is put on the hull when it goes overboard, as every section along the fore-and-aft line of the new ship theoretically meets the water at the same time. Regardless of the way a vessel takes her initial dive, she is invariably launched with check lines or heavy hawsers trailing out behind to bring her to a standstill before she reaches midstream. When a ship glides down the ways, she really slides on a thick coating of launching grease. This is ap-



plied to the stationary ways, over which slide the moving ways that cradle the ship. Were it not for this lubricant, the ponderous moving weight would generate enough heat to start a dangerous fire.

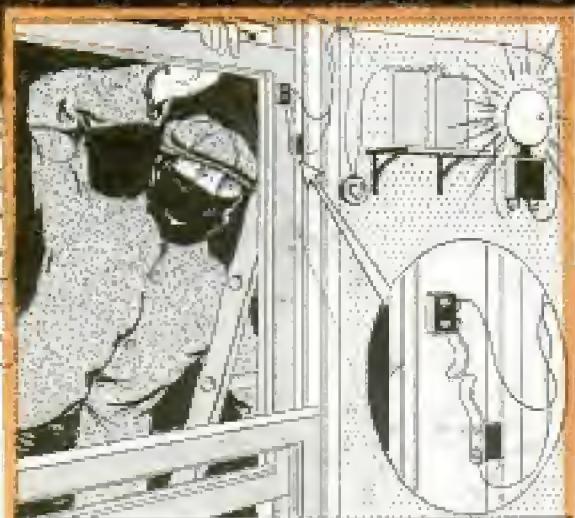
B. 564
July 1931
Central Engineering
Laboratory 3945 Cleveland

March 1928 A. M.
622.

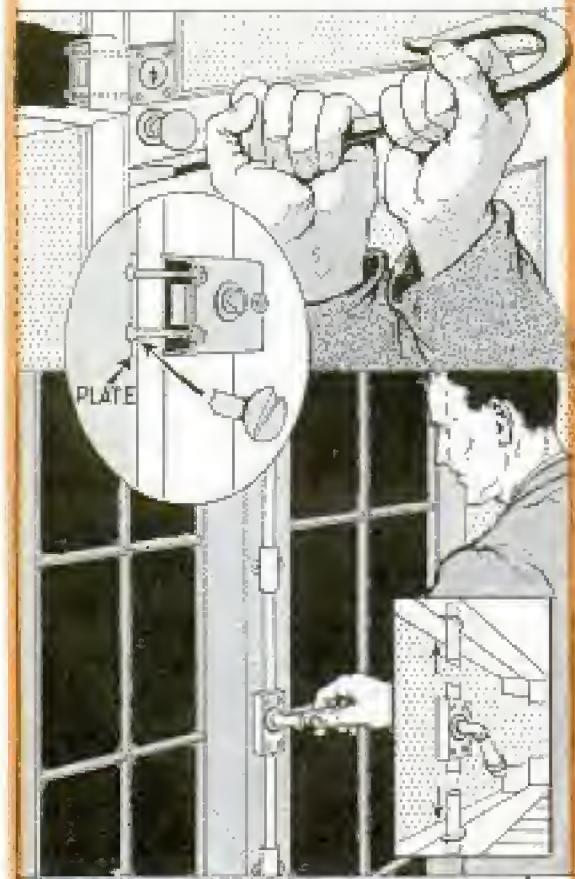
How SAFE is Your

By William J. Burns

Internationally Known Detective



An Electric Switch, Which May Be Made or Purchased, Connected with an Alarm Bell Will Defeat the Efforts of the Cleverest Burglar to Enter a Home through a Window



Bolt Locks to Doors so a Jimmy Will Pry Out Screws; a Steel Plate Prevents Cutting the Wood; Use Rod Lock and Electric Alarm on French Windows

SINCE the first morning the newspapers were black with headlines telling of the kidnaping of the Lindbergh baby, I have been swamped with appeals for help.

Many were from multimillionaires, but some were persons in modest circumstances. All of them feared for the security of their homes. They wanted me to tell them how they might better protect themselves against criminal intrusion.

The most important thing in looking to the security of a home is to make sure that there are no traitors in it. In medieval times, nobles surrounded their castles with a water-filled moat, and all who entered or left had to pass over a drawbridge. These fortress-homes were easily defended so long as the inhabitants took precautions against treachery. But not even a castle was safe when there were secret enemies inside the walls. What, you ask, has all that got to do with crimes against homes in the twentieth century? A great deal, I assure you.

Lately, we had to deal with a case brought to us by a burglary-insurance company. A rich Philadelphia book collector had presented a claim against the company for \$26,000. The man was insured against loss, and the company had to restore the stolen goods or make the loss good in money.

The rich man's library was a treasure room, containing, on shelves that extended from floor to ceiling, rare volumes for which he had paid fabulous sums. It was some of these books that had been stolen, books that he loved far beyond their price.

The first thing we did was to investigate the character of the butler who, after three months' service, had vanished about the time the thefts were discovered. We found out that he was a criminal with a record of many arrests and convictions.

Home?

Yet for three months he had been a trusted member of the rich man's household.

I made it my business to inquire why he had hired a butler without investigating his character. "Why," he said in surprise, "it never occurred to me to do so. I asked an employment agency to send me a good man and when this one came, he had a bundle of letters of reference. What other precautions should I have taken?"

"Well," I said to him, "I'll tell you what other precautions the very richest families in America take when they hire a new servant. They have competent private investigators check through the years of the strange servant's past life and make sure that he is what he pretends to be. They make sure the offered references are not forgeries, and if they are genuine letters of recommendation, they make sure that they have been presented by the same person to whom they were given."

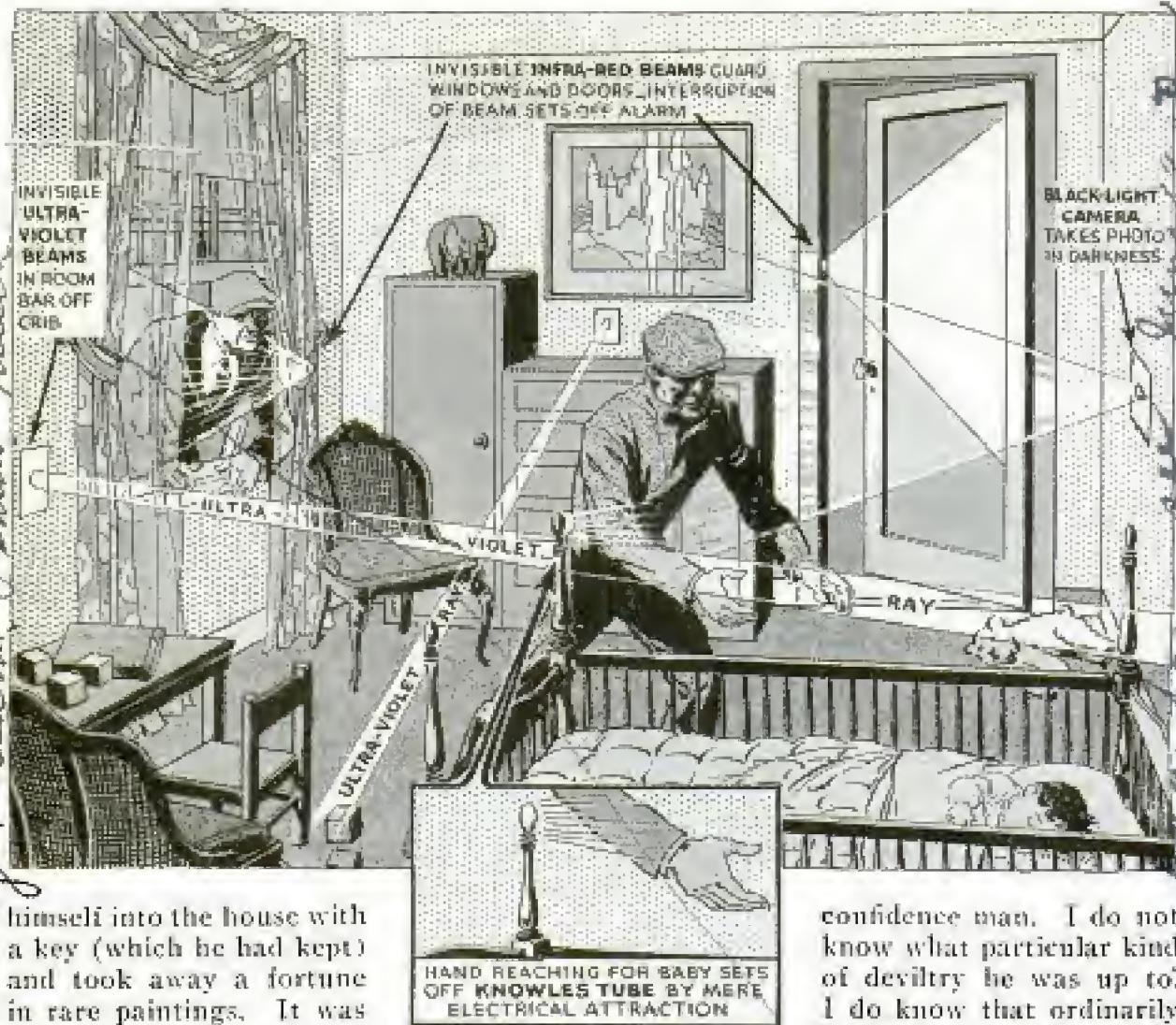
It is a constant source of amazement to me how otherwise brilliant and shrewd Americans can be so careless about hiring servants who will share their homes. It never seems to occur to them that it is easier for a burglar to get a job in the house he is going to loot than it is to break into that house.

Out on Long Island there lives the president of a great holding company. He is



worth many millions of dollars. All his employes who handle securities are bonded, and all others who work in the building had been investigated, but the servants in his home had not.

The home is a large stone house, richly furnished. The man and his wife live there alone except for their servants. Their hobby is the collection of fine paintings. On the walls are works by world-famous artists, such as Gainsborough, Fragonard and Whistler, besides priceless tapestries. You might have supposed they would give some thought to security. Well, now they do; but a few months ago they were decidedly negligent. They employed English servants who remained a short time and then left. Then one night the old butler returned with some confederates, let



Some of the Invisible Electrical Guardians Which Give Absolute Protection against Criminals in Rooms

Burglar alarm makes thief's night a lonely one

himself into the house with a key (which he had kept) and took away a fortune in rare paintings. It was a grim and unpleasant surprise to that old couple to discover that their English butler was an English convict, once an inmate of Maidstone prison.

Even good servants, whose lives have been above reproach, sometimes make the wrong kind of friends. Mind you, the best ally the kidnaper can have is someone who is employed in the house against which he is plotting.

Lately, one of the best known and richest families in this country became disturbed just about the time they normally go to Florida. They asked us to investigate their governess. This woman had almost complete charge of their children. They trusted her, but they suspected she was secretly meeting a man. Who was this man?

We shadowed the woman discreetly until she met the man. Then we shadowed him. We found out he was a well-known

confidence man. I do not know what particular kind of devilry he was up to. I do know that ordinarily he seeks romance in the company of women rather better looking than that governess. Probably he

had some scheme of using her to strike at members of that rich family, perhaps kidnaping. Whatever his scheme may have been, we spoiled it.

I could cite thousands of cases like that one. The police are too justified in their usual suspicion after a house has been robbed that it may be an "inside job." Nevertheless some of the most daring second-story men in the country never bother to enlist the aid of servants. There is, for example, "Boston Billy" Williams. His present address is Dannemora prison, the Siberia to which the most dangerous New York criminals are sent.

Boston Billy was captured near Bridgeport, Conn., by one of my men who had been looking for him in connection with the looting of a number of multimillion-

*Westinghouse Electric
Mfg Co. East Pittsburgh
Pa.*

see p. 20 3. Feb. 1931

~~\$5.00~~
Microphones see July 1932 '35

B. 564

POPULAR MECHANICS Connected Telephone & Other Cordon

775

aire homes on Long Island. Before Boston Billy was sent away for a long stretch in prison, we talked with him, seeking light on his working methods. He told us that when he planned a big job he would go to the place he intended to rob and simply sit on the lawn and watch the house. He would watch as light after light on the upper floors blinked out. Through the windows he would see the family gathering around the dinner table. When, at his observation post, he was sure the upstairs was deserted, he would go to work. As a second-story man Billy has few equals. He can climb the side of a house as readily as a chimpanzee, using a porch, a trellis or an ivy vine and then leisurely ransack the place.

Now, lest you get the idea that Boston Billy is a nice gentle soul, I will tell you that he often worked in the days of his freedom with Arthur Barry. It was Barry who slipped into the home of the Joshua Cossdens on Long Island and from a bureau in a guestroom, where Lord and Lady Mountbatten slept, stole the jewels of those kinfolk of the Prince of Wales. For this crime and others equally daring we tracked him down.

We thought Barry was safely locked up in Auburn prison for a long time to come, but one day a riot broke out in the prison. Two men were killed; sixteen were badly wounded; a large part of the prison was wrecked, and Barry and another man got away. Once outside the walls, with loaded pistols in their hands they held up the driver of an automobile, forced his wife and child to get out and then made the man drive them away. At an isolated spot, Barry informed the automobile owner he was going to kill him. The man pleaded for his life.

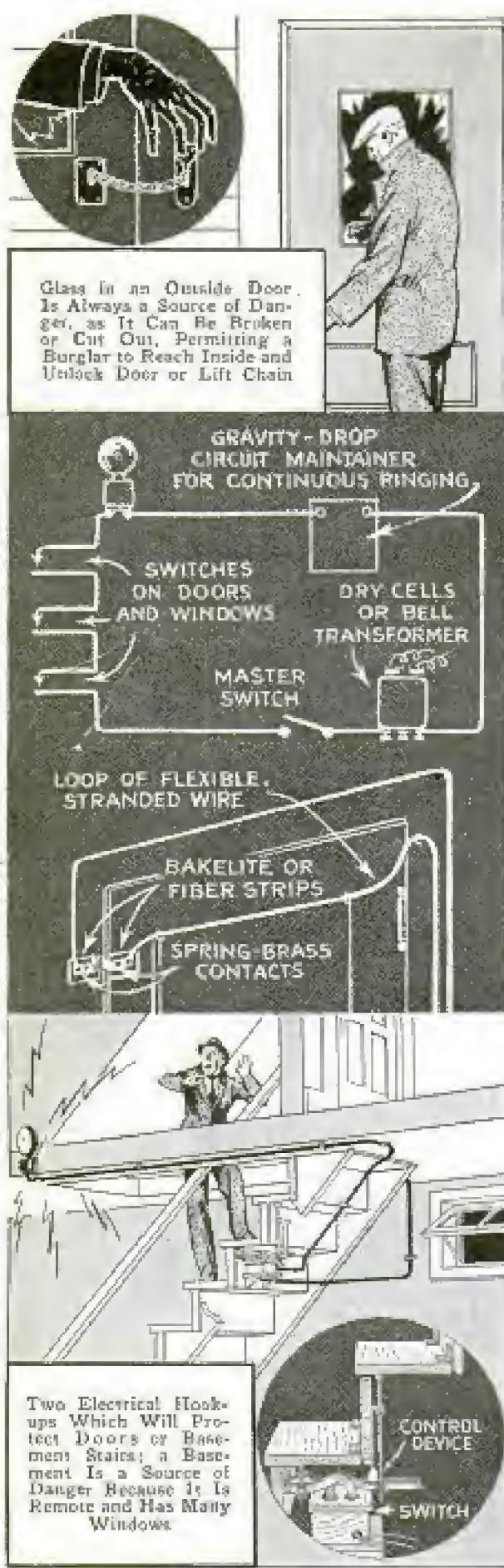
"Naw," snarled Barry, "I'm going to knock you off so you can't testify against me. I'm going to kill you. Get out!" The ferocious convict's gun was pressed against the man's neck. He had one slender chance and he took it. Suddenly he swung his arm violently, succeeded in knocking the gun from Barry's hand and fled across the field, zigzagging like a rabbit so that none of the bullets fired after him by Barry did more than splash up the dirt about his feet. That's the kind of a man Barry is. That's the kind of men I



A Simple Hinge with Sharpened Point, or a Wooden Wedge, Will Jam a Window So It Cannot Be Raised, Making It Safe Except When Glass Cutters Are Used by Burglar

Two Levers Which Are Safer than Locks When Properly Installed with Bolts; Never Use Screws to Attach Any Protective Device as They Pull Loose from Wood Too Easily

Overland 1935 Broadway New York City, U.S.A. And elsewhere



have in mind when I talk about the underworld—vicious men, cruel men, selfish men. There is not a thing romantic about a crook.

Now, none of us want that kind of brutes invading our homes whatever their purpose. The question is: How are we going to keep them out?

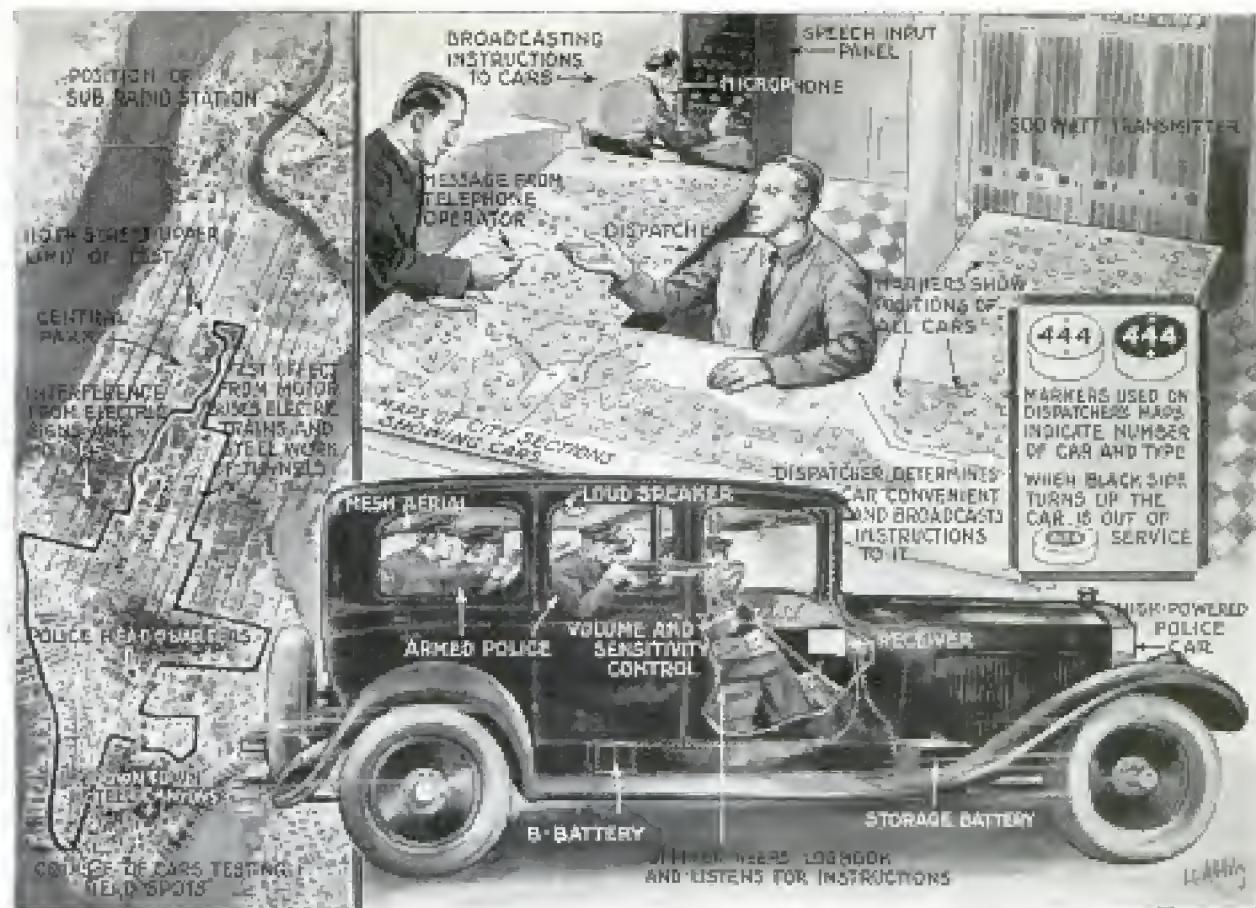
First of all, as I say, the servants, if any, should be absolutely trustworthy; people as honest and dependable as ourselves with a loyalty beyond question. If the home is that of a family able to afford it, there should be a competent man on guard at all times. No child has ever been kidnaped in this country where there was a guard on the job to prevent such a crime.

I can sympathize with those who worry today because of this monstrous threat. I know what it is to lose sleep from that kind of fear. When I was investigating the San Francisco graft cases and, afterward, when I was trailing the McNamaras for the dynamiting of the Los Angeles Times and other bombing outrages, I worried about kidnapers. You see, I had been warned that if I did not "lay off," one of my children would be stolen. My youngest child was a little girl then, and she was never allowed out of the house without the escort of an armed and trusted man.

What about "gadgets"—burglar alarms and similar devices? In my own home, I have always had an electric button near the head of my bed. If I press it, a large gong rings on the outside of the house. That gong would arouse the neighborhood and it would scare an intruder out of his wits. So far I have never had occasion to use it.

Some of my rich clients with estates in the country, following my advice, have had special protective lighting systems installed. In one admirably effective case, this system is entirely separate from the house-lighting system. Within reach of the master's bed is an electric switch. When it is thrown, the darkness of that estate becomes as brilliant with the light of flood lamps as if the sun were shining.

"Don't turn on the lights in your house to hunt an intruder," I instructed that client. "You'll make a target of yourself that way. Instead, illuminate the outside of your house, and when your gong fright-



Latest Radio-Police System, Designed by Western Electric for New York City, Gives Dispatcher Complete Control of 400 Cars and Covers 316 Square Miles of Territory

ens the intruder into running away, he will be the truth, even though he is a mongrel. A country house ought to be becomes the target."

For persons who cannot afford these protective arrangements, there are cheap and effective devices that will serve against all but the most determined intruders and often against even these.

At the ten-cent store any householder can buy patented wedges so fashioned that the harder a thief pries at a window secured with them the tighter that window remains closed. Also at the ten-cent store, the householder can buy bolts and chains that add to the difficulties of a burglar. These things are doubly effective if, when the burglar who struggles to overcome them makes a noise, there is a keen-eared dog in the house.

I have always had great faith in the protection given by a watchdog. When a dog gives an alarm as the grocer's boy peddles up to the back porch, he should be encouraged. Every time your dog tells you with excited barks that someone is approaching your house, make a fuss over him. Tell him he is a good dog, for that

LEATHER MADE FROM WASTE LIKE PRESSED WOOD B. 575

A way to shred waste leather and press it back together in usable sheets has been developed. Shoe manufacturers, sole cutters, cobblers, belt makers and other users of leather have been wondering for years what to do with chips and cuttings, worth nothing, that they throw away. Who wants to pay them from \$2 to \$5 a ton, but for which there was no market. As in the case of waste wood, shredded and pressed into building materials sometimes of totally different forms, the new method untangles the fibers, presses them into a new sheet and makes a material as useful as the original leather and probably cheaper. Among the immediate forms the product is expected to take are leather paper, linoleum substitutes, wallboard and insulators.

Charles D. Ingersoll
90 H. & L. Leather Co.,
Park Ave. New York

in Chemical and
Metallurgical Engineering.

LIGHT IN PLANTS AND ANIMALS
MADE VISIBLE TO MAN



Ultraviolet Rays Turned on Glass Jar Filled with Tree-Bark Extract Bring Out Invisible Light

Light given out by living substances, both animal and vegetable, can be made visible to man by directing ultraviolet rays upon the substance. In one experiment, a glass jar filled with a fluid extract of horse-chestnut bark glowed with sufficient light to make a photograph when rays from an ultraviolet lamp were turned on it. Many other substances also respond in a similar manner.

FALSE CEILING IN GREAT HALL
IMPROVES PIANO'S SOUND

By constructing a false ceiling of sound-absorbing material, engineers so improved acoustics at Madison Square Garden, New York City, that listeners sitting a block away were able to hear Paderewski's piano as well as those close to the artist. Study of the great auditorium revealed excessive reverberation, which is the prolongation of sound by echoes from the walls and ceiling. The audience, covering the floor and banked against the walls would absorb some echo, the engineers knew, but not enough. So rock wool, made in proportions that would absorb the remainder of

the sound, was laid in sections on the structural girders below the natural ceiling. When Paderewski appeared in recital, the false ceiling, 47,000 square feet in area, eliminated the twang common to pianos played in large auditoriums.

"WINGLESS" FOWL BEING BRED
TO MAKE FENCING EASY

"Wingless" chickens are the objective of experiments being conducted by Dr. D. C. Warren, of Kansas State College, who hopes to develop fowls that cannot fly over low fences or gates, thus making it easier to handle and care for them. Using chickens from a flock in which the wingless trait has persisted for nearly twenty years, he is crossing these birds with those of another breed in order to study possibilities of the peculiar trait being inherited. Although termed wingless, these birds are really only flightless.

NON-SKID HIGHWAY PAVEMENT
MAKES MOTORING SAFER

Increased safety for the motorist is provided by a non-skid pavement applied to a test strip of a Georgia highway. Autos traveling fifty miles an hour can be brought to a stop in one-half the distance ordinarily required, while cars going forty miles an hour can be stopped in thirty-nine feet, as compared with the old record of eighty. Vibration and sidesway at high speeds are reduced to a minimum.



Non-Skid Pavement Covered with White Powder Shows Length of Brake Action in Stopping Auto

Electrical Research Products
One. 1731 W. 22nd
Chicago

Warren Bros. Co.
38 Charles River
Road, Boston, Mass.

Mr. A. H. Woods, Johns Hopkins
University, Baltimore, Md.

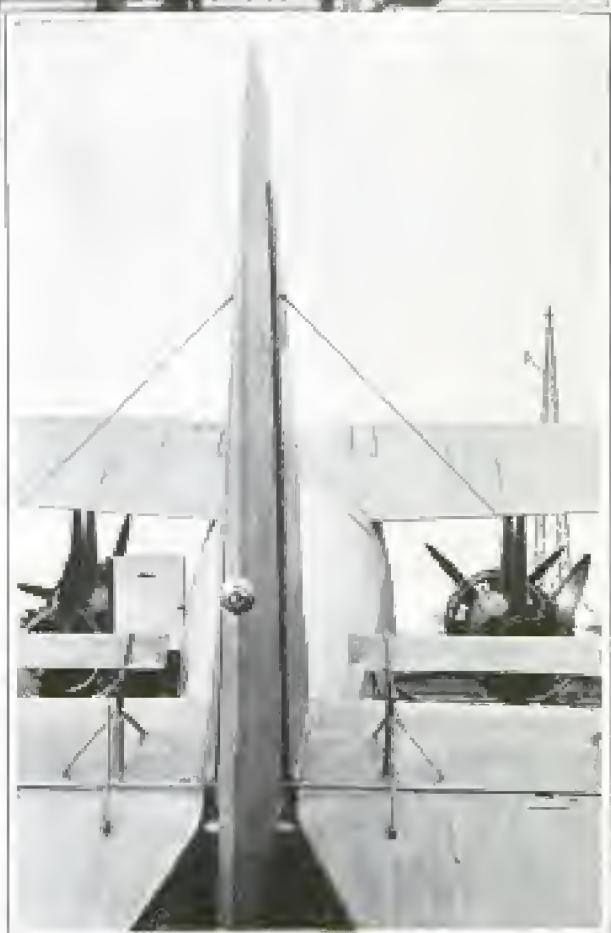
Science Service
March 2/26/32

"Do-K" Shows Speed in German Test Flights



© New York Times
View Underneath "Do-K," Showing Zeppelin-Shaped Fuselage; at Right, Novel Tail Structure

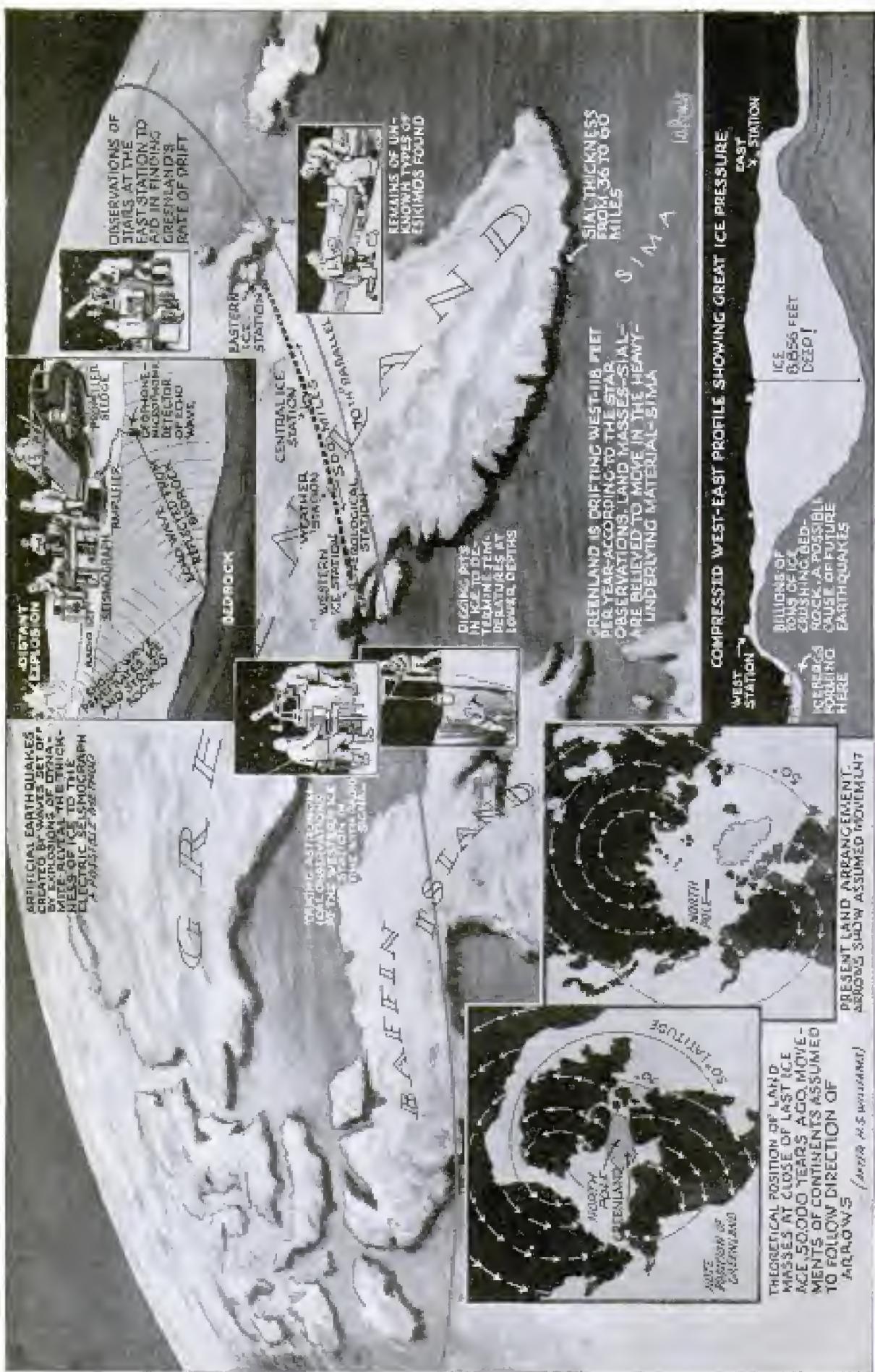
"Do-K," a sister ship of the Dornier "Do-X," giant seaplane, has been completed and successfully test-flown in Germany. In its preliminary flights, speeds of 125 miles per hour were easily reached, with the throttle not yet full out. Several departures from conventional design are noted, among them an extra surface above, and, working in conjunction with the elevators, something like wing slots in appearance. Tandem engines are mounted under each side of the single wing, those in front being equipped with four-bladed tractor propellers and those in the rear with the usual two-bladed pushers. The engines are of German design and develop 200 horsepower each. An additional feature is the position of the pilot, whose cockpit is placed ahead of and above the wing, giving him perfect vision on all sides. The plane is designed for passenger traffic over land, is streamlined like a racer and has the appearance of complete stability. This is the first "traffic" plane to



be built by Dornier with more than one or two engines. It recently made its first cross-country flight.

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Logan St. Dennis, 55 cl. 4/2 md. New York



Drawings Showing Some of Operations and Theories of German Scientists Who Went to Greenland to Try to Prove Continental Drift by Star Observations; They Also Made Tests on Assumption That Ice Masses Are Destroying Underlying Balance of Island and Studied Atmospheric Effects for Future Weather Predictions

METAL BLOWN FROM ITS ORE
LIKE BREAKFAST FOOD *Bz 1409*

Stuffed tight with steam, huge chunks of iron ore are blown to pieces as if they were grains of wheat or oats being made into breakfast food, through a new metallurgical process described recently before the American Institute of Mining and Metallurgical Engineers. Little expense or labor is involved in the employment of the method which is expected to work something of a revolution in mining and smelting processes. Both zinc and iron ore thus far have been successfully shattered. The pores and crevices of the ore first are saturated with water, then the ore is heated under pressure until this water turns to steam. When the pressure suddenly is released, the expanding steam literally blows the metal out of the ore. Fuel expense is said to be about five cents per ton of ore treated, which is expected to result in the salvage of much lean ore.

FAST MYSTERY AUTO IS BUILT
FOR TRY AT RECORD *Bz 305*

Streamlined even to a "bull's-eye" window in the rear, a powerful mystery car with engine mounted over the rear axle was recently being assembled at Maida Vale, England. It was announced that the car would seek to set a new world record for a thirty-six-hour non-stop run, and that probably Kaye Don, holder of numerous world records in auto and boat racing, would drive it. The car is unusual in appearance because every effort has been made to reduce wind resistance. The rear window is of special glass to afford a wide view of the road behind.



Mystery Auto Extremely Streamlined for an Attempt
on the Thirty-Six-Hour Non-Stop Record



Detective Making Moving Pictures of Gambling Operations, and Some of Scenes He Snapped

SECRET MOVIES HELP CONVICT
LAW BREAKERS IN COURT

Motion pictures, snapped from a secret vantage point, were used recently by Los Angeles police officers to convict several gamblers. The movies were made by a detective from an upstairs window across the street from the gamblers' place of operation. Projection of the pictures during the trial served to corroborate the testimony of officers and to identify the defendants who were seen as unconscious actors in the "pay off" at the game's end.

"COLD FLAME" IS MADE VISIBLE
BY LIMESTONE SCREEN *Bz 499*

Although the human eye cannot see the infra-red rays, they have been made perceptible through the medium of a certain type of calcite, or limestone. Minerals have been known for some time that will make ultraviolet, or "black light" visible, by stepping up the rays as a transformer steps up electricity, into longer wavelengths. Color is all a matter of wavelength, the infra-red being those frequencies longer than red. Only the frequencies between red and violet are visible to the naked eye. Now it has been found that this calcite will step down the infra-red rays into waves sufficiently shortened for the eye to perceive them. Heat waves containing infra-red rays will make the calcite glow while the mineral itself is cold.

Samuel J. Isaacs
Associate Curator of Mineralogy
Academy of Natural Sciences

Cont. Streaming blossom
2207 Bellwood Ave., Calif.

EASIER

WAYS



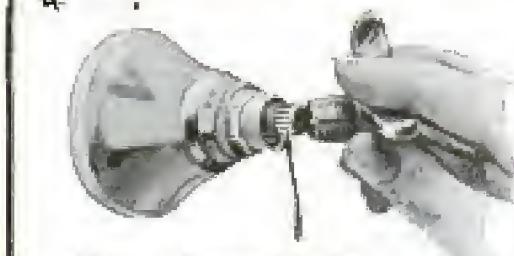
Above, Electric Comb That Plugs into Light Socket; It Is Used in Applying Warm Liniment, for Drying the Hair, and Also to Hot-Massage the Scalp.



Washing Vases, Milk Bottles or Tall Dishes Is Simplified with This Elevated Sink Faucet Which Permits Turning Water into Containers with Narrow Necks.



Double Strainer for Kitchen Sink Which Enables the Housewife to Use the Sink Itself as a Pan for Washing Dishes



Above, Interchangeable Handle for a Brass Plumbing Fixture with a Knurled Fitting

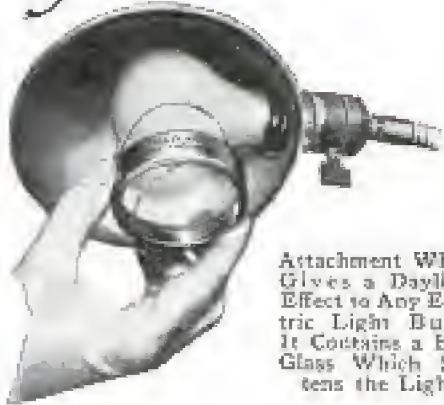


Wire Shoe Tree Which Fits over Outside of Sole, Instead of Inside the Shoe, and Draws Leather of Upper and Sole into Position



Mop Pail with a Wringer in the Form of an Inverted Cone Set in the Top; the Mop Is Placed in the Cone and Given a Turn

of DOING IT



Attachment Which Gives a Daylight Effect to Any Electric Light Bulb; It Contains a Blue Glass Which Softens the Light



Left, Saucepan Lid of Heat-Resisting Glass Makes It Easy to Watch Any Cooking Food

Right, Self-Starting Cream Siphon That Drains Off Cream When Dropped in Butter; Aluminum Tube Has Opening near Cream Line



Metal Bathroom Cabinet Hinged to Inside of Door; There Is Also a Model for the Kitchen Containing Hooks and Shelves for Utensils and Supplies

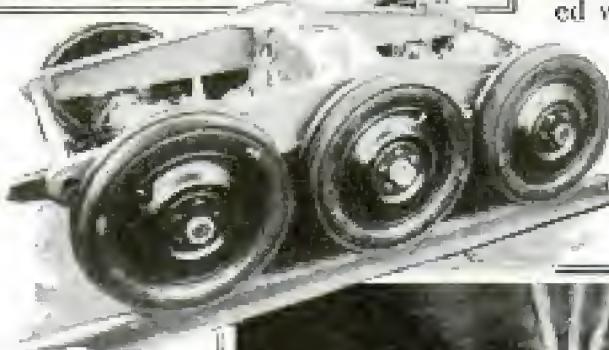


Left, Enamelled Metal Wall Tile Which Is Easy to Apply to a Surface Covered with Oil Cement; the Metal Can Be Bent around Corners; Right, Spiral Wires That Hold Bulbs in Any Position in Bowl



Seven-Ton Rail Car Makes Mile in a Minute

B



Interior and Exterior Views of Lightweight Rail Car, Made of Welded Stainless Steel, and Its Pneumatic Tires

weighing only 14,000 pounds and built of welded stainless steel, a lightweight railroad car that is self-powered has been constructed in answer to the demands of the railways for auxiliary operating equipment costing less to build and use. The car, containing not one rivet, rolls on pneumatic tires equipped with flanges and is driven by a Diesel engine of eighty-five horsepower at a speed of sixty miles an hour. The usual type of gasoline or electric motor also can be employed for power. The weight of seven tons compares with from 120,000 to 150,000 pounds for large day coaches and Pullman coaches. The car is forty feet long and carries forty passengers. Half of its total weight is contained in the power plant and running gears. When using a Diesel engine, it is claimed that the car can be operated at a saving of one-third to one-half the cost of running existing rail cars of similar capacity. The windows do not open, but are equipped with curtains, ventilation being provided by overhead ducts. A system of indirect lighting is used, the rays being diffused from the

sides of the coach. The brakes are of the hydraulic type, and the car can be stopped within 500 feet when traveling sixty miles an hour. Wet weather does not affect braking efficiency as the tires on the front wheels act as a "squeegee" to remove moisture from the rails so the rear tires can grip. Space is provided for 1,500 pounds of baggage and parcels, and small hand baggage can be stored beneath the seats. The driver's window is provided with heating equipment to keep the glass always free of snow or sleet. It is expected that the car can be used on electric interurban rail-

ways and that its efficiency in this service will be equal to that claimed for it on steam roads.

The Popular Mechanics' Bureau of Information offers its free service to all readers of our magazine. Names and addresses of manufacturers and dealers in articles described, and any other details in our possession, will be promptly furnished by addressing the bureau.

Cards Baldwin Locomotives
200000
and Night on Lines
and Night on Lines
and Night on Lines
and Night on Lines

Frank M. Johnson,
Suppl. POPULAR MECHANICS

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General Land Office
THREE MORE "GHOST SURVEYS"
ARE RECHECKED BY U. S.

B 366

Three more western "ghost surveys" have been subjected to the check of the transit and chain and have been fitted into Uncle Sam's checkerboard, by which citizens may locate their real estate. One of the areas is a 140,000-acre tract in Colorado, another in Nevada, and a third in Wyoming. These areas were supposed to have been surveyed back in the eighties, but it was found the government plats were based on surveys made without running any lines or driving stakes. They were made by fraudulent contractors in the days when many surveys were made in such fashion. One of the most famous of these ghosts was found with the discovery of oil in the Salt Creek field of Wyoming. The government plat stated that the standard corner was described in its relation to four trees, immediately adjacent, when as a matter of fact there was not a tree in the entire Salt Creek area, nor within thirty miles of it.

B 296

E 1540
ELECTRIC LIGHT ON TELEPHONE AIDS IN FINDING NUMBERS

Looking up telephone numbers is made easier with the aid of an electric light without wires that fits on the desk phone. It has a light bulb at its lower end, and pulling down the bulb makes a contact with a battery attached to the instrument, thus making the device a sort of inverted flashlight.



B 229
"JUMP CLOCK" IN AUTO MIRROR TELLS TIME QUICKLY

Combining an eight-day timepiece with a graceful non-glare rear-view mirror, an automobile accessory has been introduced that will fit readily on the ball joint of the mirror now in the car. The novel feature of the combination, however, is the "jump

B 3048
Jaeger Watch Co. Inc.
45th St
New York City



Mirror-Clock with Hours and Minutes Like Speedometer

hour" mechanism of the clock. There are two dials, similar in appearance to certain types of speedometers. At the top is the hour dial and below the minute dial, marked, by fives, from five to sixty. As the lower dial, one figure of which is visible at a time, moves to the end of the hour, a new hour figure "jumps" into place on the top dial. There are no hands to confuse the eye, and a quick glance immediately tells the time. The clock is electrically lighted with a self-contained switch and the wind and set shaft is flexible. The reflecting area of the mirror itself is larger than usual, so that it will not be necessary to make continual readjustments of it while on the road.

RUBBER PAD ON SHAVING BRUSH REPLACES BRISTLES

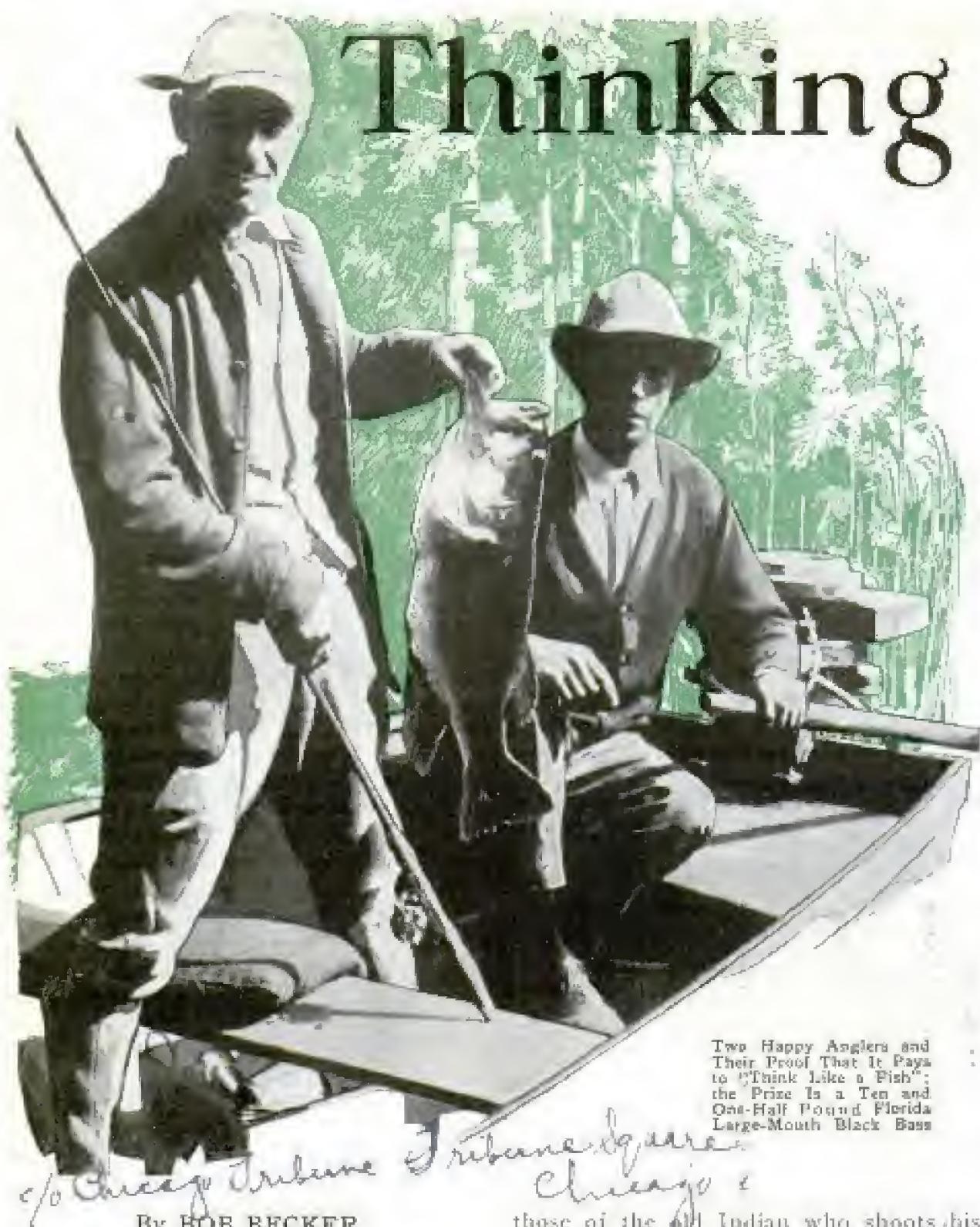
B 338

Instead of bristles, a shaving brush now offered contains a soft-rubber pad for applying the lather. In one operation it massages the face and packs firm, moist lather into the beard. Little water is needed.



Shaving Utilities,
Inc., Indianapolis
725 Indiana Ave.

Thinking



Two Happy Anglers and Their Proof That It Pays to "Think Like a Fish"; the Prize Is a Ten and One-Half Pound Florida Large-Mouth Black Bass

c/o Chicago Tribune Tribune Square
Chicago 1

By BOB BECKER

LIIGHT skies and spring air stir the blood of 10,000,000 to 15,000,000 fishermen in the United States. This vast army of anglers comes streaming out of the biggest cities and the tiniest hamlets, with every imaginable kind of equipment and notions.

There is every variety of lures—from

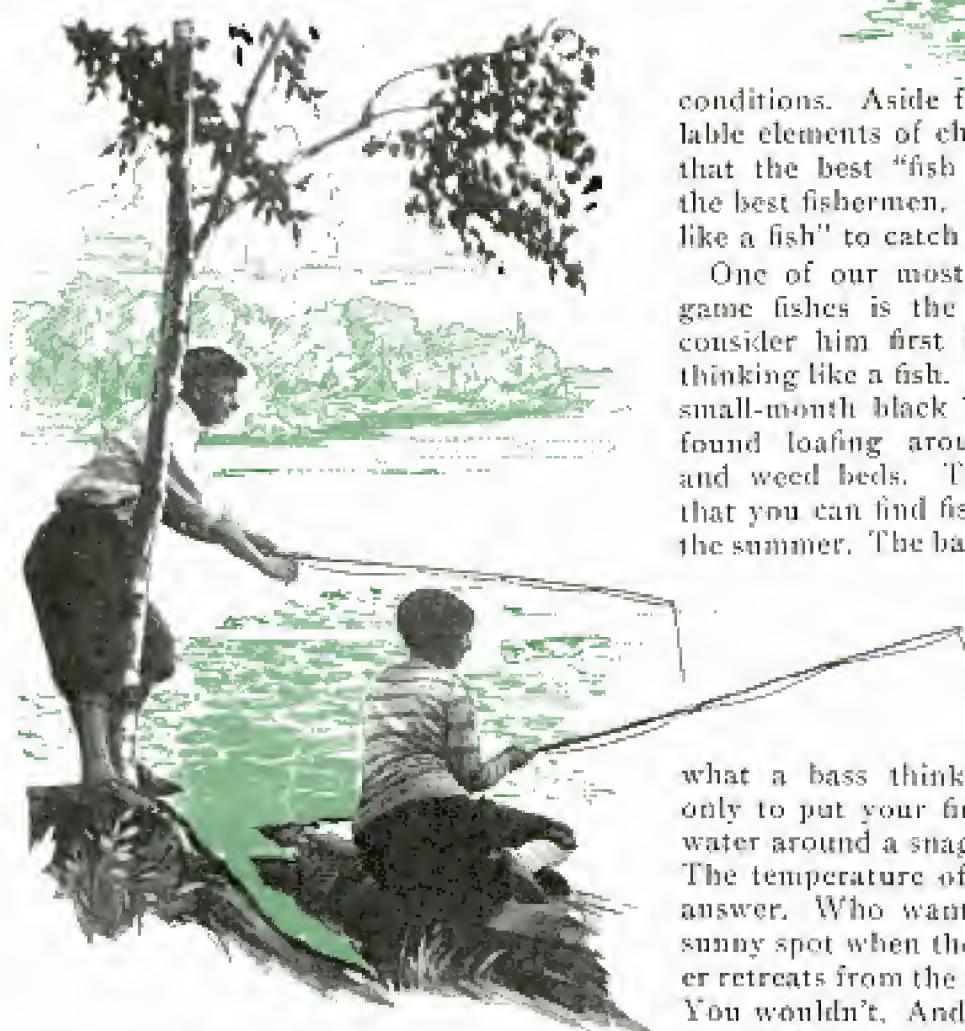
those of the old Indian who shoots his deer, makes a bucktail and starts casting, to the tricky artificial devices and toothsome morsels of live bait—all intended to fool the finny tribes.

Some of these millions of fishermen will be successful. Others will have indifferent luck, and some will come home empty-handed. In all of these divisions will be a fairly even distribution of tackle and

Like A FISH



To Catch Trout, You Must First Decide Where They Are Likely to Be Found; These Anglers Are Fly-Casting for Them in a Swift-Water Pool, a Likely Hiding Place



This Patient Couple Is Still-Fishing for Perch and Bluegills, Using Angleworms for Bait

conditions. Aside from the uncontrollable elements of chance, it is probable that the best "fish psychologists" are the best fishermen. You have to "think like a fish" to catch a fish.

One of our most popular American game fishes is the black bass. Let's consider him first in our program of thinking like a fish. Both the large and small-mouth black bass are commonly found loafing around stumps, snags and weed beds. This does not mean that you can find fish there all through the summer. The bass moves from these spots when the July and August sun heats the water.

If you are curious to know what a bass thinks about, you have only to put your finger in the shallow water around a snag in a northern lake. The temperature of that water is your answer. Who wants to loaf in a hot, sunny spot when there are shaded, cooler retreats from the blistering dog days? You wouldn't. And a bass doesn't care more about getting overheated than you do. They seek the shade of weed



Top, a Wall-Eyed
Pike Taken from a
Lake Bar in Eight
Feet of Water;
Below, a Big
Northern Muskel-
lunge

beds. Especially those beds of vegetation that reach far down into the lake. Or, they lie on, or near, underwater bars. If the lake has springs, or if streams of cool water are flowing into it, the finny inhabitants will move to such refreshing patches of the water.

This simple illustration is of very real importance. If the beginner fisherman will reason this out, he will not waste his time casting shallow water on a hot day. As a canny old guide once said to me: "Look in the cyclone cellars for 'em when it's hot."

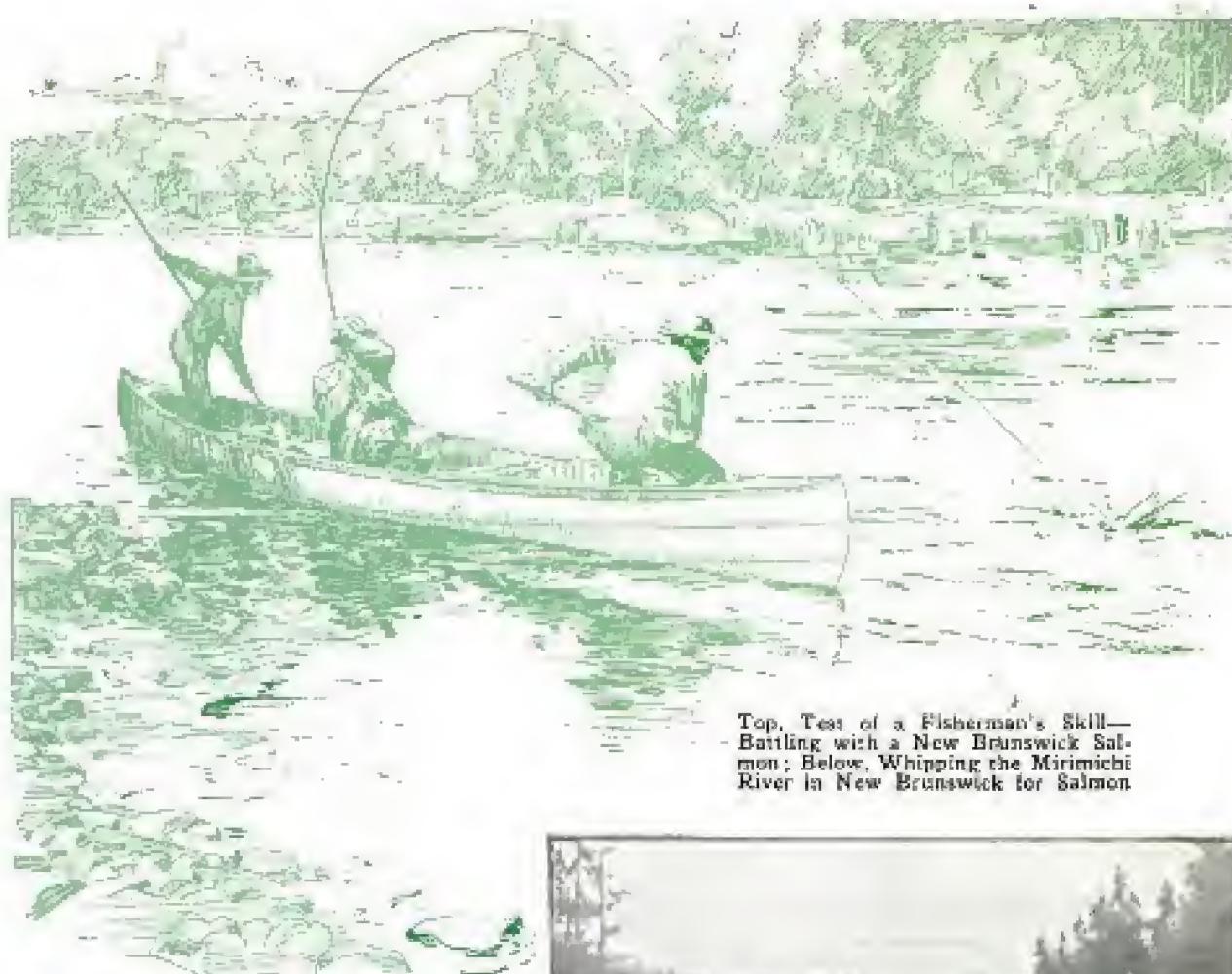
A mighty successful program to follow in midsummer is this: Begin by assuming that the fish are in deep water, on a bar, probably. The problem is how to find them. I usually begin by trolling with live bait. Attaching a small dipsey sinker above the minnow, I drift across the bars

until I get a strike. Then, down goes the anchor. Where there is one fish, there is apt to be more.

Still thinking like a fish, let us examine what happens when the sun goes down and marks the end of a hot day. When night comes and the waters darken and cool, it is quite natural for the bass to think about food. Morning and evening are usually associated in fishermen's minds with the feeding activities of the finny tribes in fresh water. In pursuit of our bass, the next question is: Where are the minnows that the fish feed on?

They are in the shallows. Darters, young perch, and other small fish, know instinctively that they are safer in the shallows. When evening draws a gradual veil across daylight, the big fish invade the haunts of the little fellows. Feeding begins. Thereafter, the wise angler will do his casting among the rushes, on the shallow bars and around the weeds close to shore at nightfall. The presence of feeding fish can often be seen by the swirls of the big fellows as they chase minnows.

In a general sense, all our game fishes like cover such as weed beds and snags. Even the little basses, such as the rock bass, crappies and calico bass stick close to something that gives them shelter. In the same way, a covey of quail will be



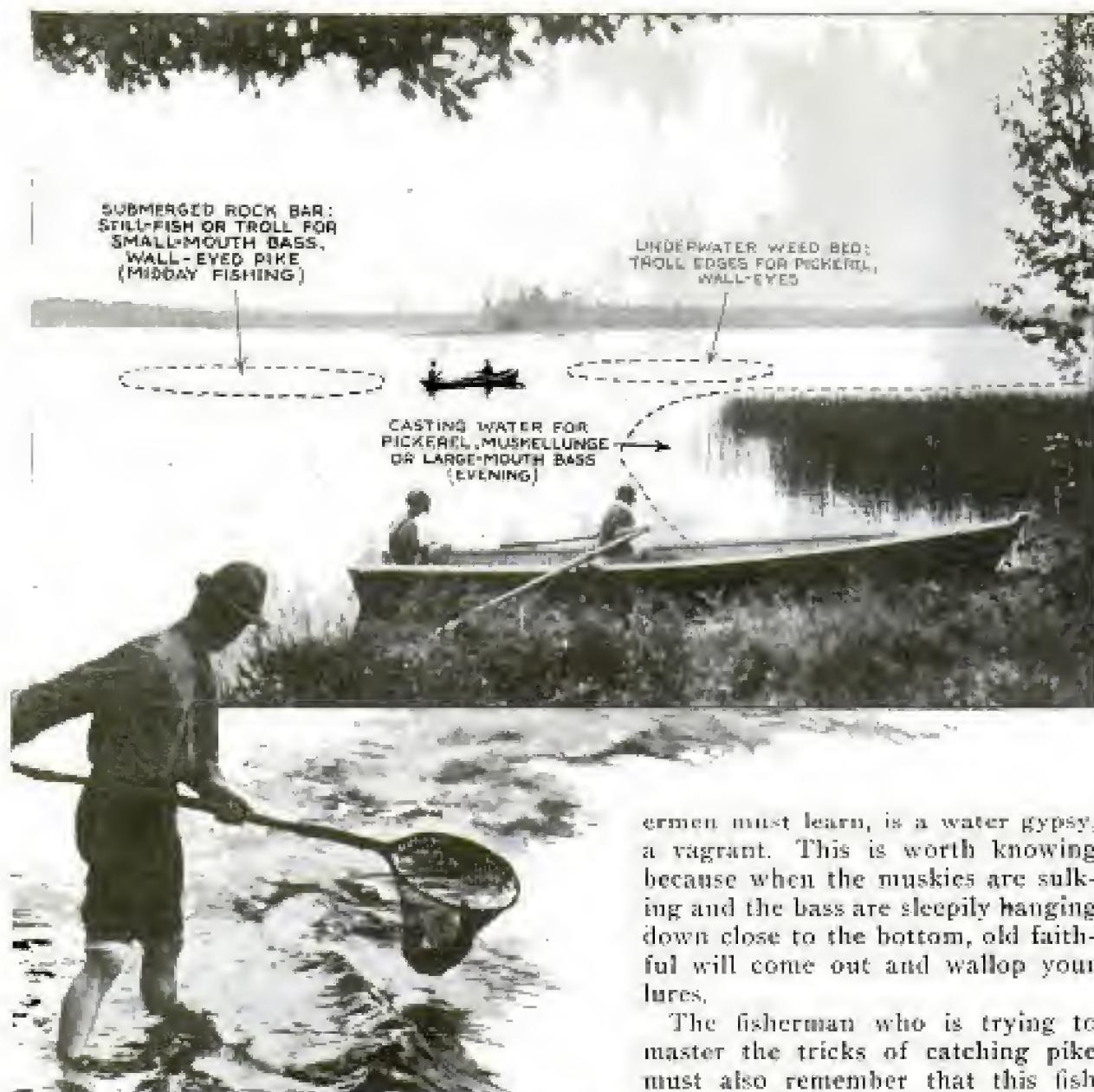
Top, Test of a Fisherman's Skill—
Battling with a New Brunswick Salmon;
Below, Whipping the Mirimichi
River in New Brunswick for Salmon.

found in a thicket. The crappie and the rock bass are partial to fallen trees lying in the water or to a big snag. This offers interesting possibilities. If you have a cottage on a certain lake, or are going to fish one lake a great deal, it is possible to concentrate your fish. You can bring them together in a continuous convention by artificially planting a snag in some place that is convenient for you.

For the fun of the experiment, I once planted one in a small lake in Michigan. Two of us hauled a lot of brush and small snags into eight feet of water. We weighted this rubbish and sank it. Then, by way of giving further inducements to the fish, we filled a small sack with stale bread, meat scraps and other kinds of food. I took my pocket knife and cut holes in the sack so that it would sink.

Three days went by and we didn't disturb our free-lunch coun-





Top, Sections of a Lake Where Various Varieties of Fish Are Likely to Be Found; Below, Netting a Good Meal

ter. On the fourth day, we went out, anchored, and fished with small minnows during the day. Toward evening we used tiny flies on a fly rod. The crappies were there by the dozens and so were the blue-gills. From that time on, this artificially constructed fish hang-out nearly always provided us with a mess of fish.

The wall-eyed pike is rapidly taking the place of the black bass in scores of lakes. If the beginner would have success in catching the pike-perch, he must know about the family. A muskellunge is apt to spend most of its life within a few yards of its favorite hang-out in a weed bed or near an old log. But the wall eye, as fish-

ermen must learn, is a water gypsy, a vagrant. This is worth knowing because when the muskies are sulking and the bass are sleepily hanging down close to the bottom, old faithful will come out and wallop your lures.

The fisherman who is trying to master the tricks of catching pike must also remember that this fish likes weed beds. In rivers they love to loaf in deep pools at the side and below a stretch of swift water where food is washed down to them by the strong current. Inasmuch as the pike is primarily a night feeder, they may not show activity during the day. But along toward dusk, a lure properly presented usually produces action.

Another good point to remember when you are trying to think like a pike, is this: When a spell of hot weather with smooth, glassy water is broken by a rain, and the wind blows cool and hard out of the north or northeast, so as to ruffle the surface of the lake with small whitecaps, go to the pike bars! This style of weather invigorates them and they hit.

In the daytime, during the hot months,



any fishermen have sighted the dorsal fin of a big muskie sticking above the water among the weed beds. He is sluggish and refuses to respond to their deep-diving lures. This is the time to reach into the tackle box and bring out a slithering surface dancer. Use a lure with a metal collar that will kick up a big fuss. Under such provocation, the big fellow will usually be attracted, make his famous rushing smash, and you will have a battle royal on your hands.

In this game of thinking like a fish in order to outwit them, we come to one of the most effective methods of fishing I have ever learned. It involves the use of a small floating surface lure worked like a dry fly. Anyone can use this method on bass, muskellunge, pickerel and other common game fish. If the lure is small enough, calico bass and rock bass will strike it.

Here is the why of it and the method of handling the lure. We begin by supposing a fish is quietly resting near an old snag. Suddenly the surface of the water



Top, Beauties from the Vermilion River in Quebec; Left, Method of Rigging Live Bait for Deep Trolling

three feet away is disturbed by something dropping on it. Instantly, the bass or crappie is alert. It watches that object which may turn out to be food. For several seconds, the floater remains motionless. Then it comes swiftly to life, wiggles a little, shakes itself, and jerks ahead a few inches. More wiggles, more movement. To the fish it looks like a crippled frog, or mouse, probably. It may be a large minnow that is partly crippled. But there it is struggling on the surface. It is fair game, and—bang!—goes the strike as the fish swings into the attack.

Thus this game of fishing is always a battle of wits with the fishermen having to do the heavy thinking to answer these questions: Where are they? What will they take? As a matter of fact, a good fisherman must learn to "hunt" his quarry at midday, where to find them at sunset, and how to locate bars and underwater weed beds, if he wants to "think like a fish."

Creek Club Back Company, Isareth, Inc.
Copyrighted material

Round Helium Container Gets Third Degree

Milwaukee, Wis.



Helium-Tank Car Loaded with the Spherical Containers for the Gas; Top, the Test Tank after It Failed, and at Right, Increasing the Pressure in Tank during Tests

The much-discussed "third degree" to which criminal suspects are supposed to be subjected is an afternoon tea compared to the treatment recently given an innocent-looking steel sphere to determine how well it would stand up as a container for transporting helium gas under high pressure. Engineers of the A. O. Smith corporation of Milwaukee set out to develop a helium tank car that would not contain as much dead weight as those being used. Because of the well-known fact that a hollow sphere is the most economical form of container, being about twenty-five per cent lighter than a cylinder of equal capacity, this shape was selected, and a tank car, consisting of a series of steel balls mounted on a flat bed, was designed. But first a sphere, 6 ft. in diameter and designed for 1,000 pounds' safe pressure, was constructed for the sole purpose of being tested to destruction—being tortured to death, as it were. Water was pumped into the tank producing a 14,500-

pound stress, and the welded seam was hammered with a sledge. Nothing happened, so the ball was mounted on a slowly revolving table, water pumped in to 1,250 pounds of pressure, and four air hammers were arranged so that they delivered blows on the metal in the vicinity of the welded joint. For seventy-five hours the hammers beat the steel, delivering a total of 20,000,000 blows and wearing out sixty bronze hammer heads. The sphere came through this punishment with flying colors. Because of the heat generated by blows, the pressure inside had gone up to 1,360 pounds. Some of the observers wanted to know what would happen if such spheres were involved in a railroad wreck. So the test ball, under 1,250-pound pressure, was placed on a flat car between two steel cylinders weighing over seven tons each, and the car was run off the end of a trestle at a speed of twenty miles an hour, dropping a sheer twenty-five feet. Extent of injuries to the

B-297 dno. Herbert E.

sphere: a few scratches and other marks. Then the scene of torture shifted to a railroad yard. The sphere was mounted on a platform, dial gauges were arranged to register changes in outside diameter, and pressure gauges installed to check the inside pressure. Water was pumped into the sphere until the pressure was increased, then the pressure was lowered. This was done several times, with a constant increase in maximum pressure. At one point it was found that the sphere had increased about five inches in diameter. When the pressure dials indicated that the average pressure inside the ball was 4,466 pounds per square inch, the sphere failed under the punishment. In fact, it exploded, the fragments being distributed over the yard at distances up to fifty-three feet. All breaks in the steel shell were virtually at right angles to the weld.

B-252

FOUR-WHEEL DRIVE HELPS END HIS PARKING PROBLEM

Offered as one solution to the parking problem, an old automobile that has a steering arrangement for turning its four wheels has been evolved by a Michigan mechanic. The car is powered on each wheel and is capable of moving at a sixty-five degree angle.



Wheels That Can Be Turned to Sixty-Five Degree Angle Make Parking Easy

made by Eric Karp
Pontiac, Mich



Model of a Fishing Boat Provided with a Net across the Front to Trap the Fish as They Glide into Openings on Each Side

NET IN FRONT OF FISHING BOAT SCOOPS UP THE CATCH

As an aid to the fisherman in increasing his catch, one inventor has made a model of a boat with a net spread in front of the prow. The craft is intended to push the net before it, the fish being trapped when they glide into openings on each side of the wire netting.

B-355

RUBBER APPLIED BY SPRAY GUN PROTECTS METAL FROM ACID

Applied by an air-spray gun, rubber latex is being used for lining metal containers and for covering utensils, parts and fittings which require a protective coating. Containers for acid are treated with the soft rubber, which is stabilized with ammonia and mixed in a mill with adhesives, sulphur, curing agents and pigments before being applied as a spray. The linings and coverings are built up in layers and then vulcanized.

Registry of motorboats in the United States for 1931 shows an increase of 10,083 over the 1930 total of 248,448.

Bureau of Navigation
Dept. of Commerce material

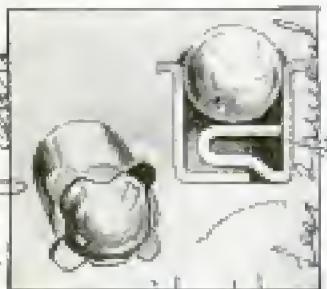
(Szelber Novelty Co.
Cooper Square
New York)

"Miss America IX" with Gar Wood at the Wheel, as She Speeded Down Indian Creek Faster than Man Ever Rode in a Boat Before

NEARLY TWO MILES A MINUTE MADE BY SPEEDBOAT

Speeding down the placid reaches of Indian creek, Fla., recently in his "Miss America IX," Gar Wood, famous American speedboat designer and the "grand old man" of water racing, shattered by a mile and a half the previous record held by Kaye Don of England. He reached an average of 111.712 miles an hour as compared with Don's recognized speed of 110.223 miles. Although the electric timing devices testified to the accuracy of the claim for a record, a dispute over official jurisdiction by the judging bodies prevented recognition as a record.

25 BALL BEARINGS FOR DRAWER KEEP IT FROM STICKING



Designed to keep furniture drawers from sticking, while at the same time keeping them tight, despite shrinking or swelling, a

Robinson & Harrah
225 14th Street N.W.
Washington, D.C.

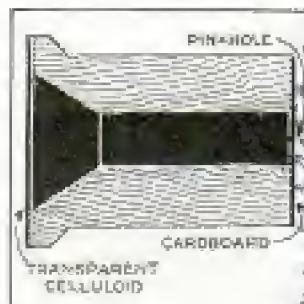
spring-scaled ball bearing has been developed. The ball rests in a retaining cup, the bottom of which has been punched in the form of a spring. The device also serves as a caster for furniture.

B 34 4-

MICROSCOPE HAS NO LENS AND IS EASY TO USE

Having a magnifying power of eight diameters, or sixty-four times, a microscope that has no lens in the ordinary meaning of the term, has been invented recently. It consists of a spool-like cylinder, somewhat enlarged at one end. At the large extremity is a piece of celluloid, while the other end is covered by a bit of cardboard with a pinhole

in its center. To use the microscope, a small object is placed on the transparent disk which is moistened to make it adhere, and this is viewed through the pinhole. To obtain good results, strong light is necessary, and the object examined should be of a partly transparent nature. The instrument operates on the principle that the diameter of an object is inversely proportional to its distance from the eye. A fly's wing, for instance, appears as large as a human hand held at arm's length.



RUST-PROOF TOOLS FOR BOATS 401 OF STAINLESS STEEL

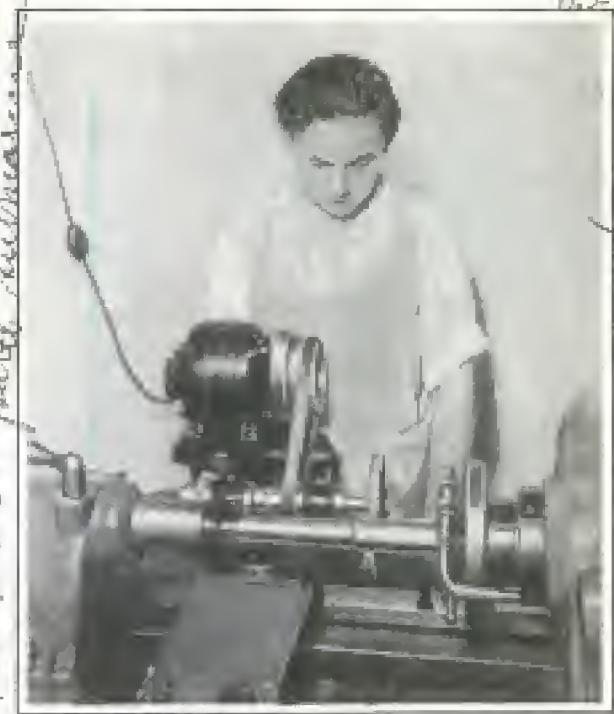
Saws, hammers, hatchets, chisels and all other carpenter tools used on ships are now being made of stainless steel to prevent rust. The dampness and salt air have always been a source of trouble for the ship's carpenter in taking care of his tools,

Idey, Elgeton Saw
Works, Fairmount Phila.

but the special steel has solved the problem, although it is more expensive than the metal ordinarily used in such tools.

"PEACE PISTOL" RIVETS STEEL AND WELDS CABLE

Operating on a new principle that utilizes every atom of power in gunpowder, a "peace gun" has been invented that will weld heavy cable with a single blow. Each grain of powder with which the cartridge is loaded is capable of exerting from one to two tons of pressure and more power is obtained with a pistol weighing twenty pounds than is provided by many of the giant drop hammers seen in steel plants. As a riveting hammer, it does away with air and is mobile. It is equally useful under water. Thirty-eight to forty-four caliber cartridges are used and there is no recoil or shock even while the operator holds in his hands a gun capable of producing 100 tons of pressure. It can be used to replace plates on sunken submarines, drill holes instantly through armor plate or for erecting the structural steel in skyscrapers. It is said that application of the principles involved would allow a cruiser armed with six-inch guns to lie out of range of a battleship and pound it to pieces. The guns are being built in various forms for different purposes, and bullets can be made to drill even hexagon-shaped holes. No rough edges are left in piercing the heaviest of plates.



Electric Grinder with Low-Speed Motor, Speed Shift Provided by Three-Step Pulley

ELECTRIC GRINDER FOR LATHEES DOES PRECISION WORK

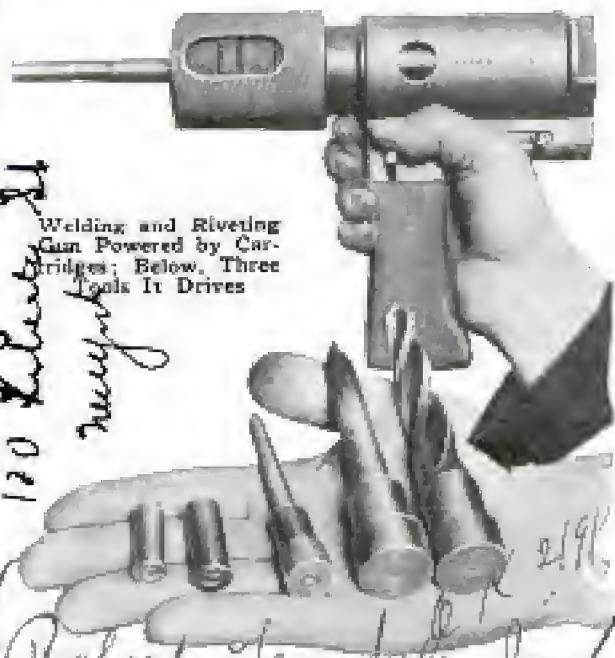
Accurate and finely finished work is possible with an electric grinder for engine and bench lathes. A low-speed motor is used with a stepped pulley to permit easy change of speed. The grinder is mounted on the compound rest, which prevents vibration and misalignment.

SLOW MOTOR TO RUN FOREVER DESIGNED LIKE WATCH

While one group of engineers at Westinghouse Electric and Manufacturing company has been developing machinery that will operate at faster and faster speeds, another has been working on a timing motor that will revolve but twice a day. Those in charge of the development say that similar motors could be built that would revolve only once a year, if necessary, or even slower. In a clock of unique design, having only four working parts, they have demonstrated the idea, and experts declare that if the four points of wear were to be sealed in oil cups, and jewels used for bearings, as in good watches, the clock should run forever without further attention. This, of course, would presuppose that the electricity that operates it were never shut off.

L. W. - Chubbl. Director
of research

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Welding and Riveting Gun Powered by Cartridges; Below, Three Tools It Drives

Robert Temple, Jr.
120 Liberty St.
New York



Left, Making Air Photo of Mineral Regions to Be Worked Up into Topographic Maps; Below, Slicing Ore Specimens into Wafers for Microscopic Study



the discovery of these great mineral resources was largely accidental. It would not have been made at this time had not a decline in the revenues of the government railroad in Alaska caused congress to direct



NEW treasure in gold, silver, copper and coal, more valuable than anyone dared to predict existed, has been uncovered in Alaska by government geologists. They found veins of coal more than fifty feet thick, a gold lode that contains over 1,000,000 tons of ore carrying between \$4 and \$5 to the ton in gold, valuable silver deposits at greater depths than any thus far reached in mining, large unmined resources of limestone, manganese and clays of various types. As happens so often,

a mineral exploration to ascertain the prospects of future revenue from minerals adjacent to the railroad running 470 miles from Seward to Fairbanks.

Nine separate projects were organized to conduct the exploration, with individual geologists assigned to Fairbanks, Kantishna, Mount Eielson, Valdez Creek, and the west fork of the Chulitna river, Willow Creek, Girdwood, Moose Pass, the an-

FOLLY" New Riches!

thracite field of the upper Matanuska valley, and a general survey of the non-metallic resources of the region other than coal.

J. M. Hill, assigned to the Fairbanks district, reports that "although little ore has been blocked out in a technical sense in four gold-lode mines actively milling ore and in several mines that are now being developed in that area, there is good reason to believe that sufficient ore is available to keep the mills active for several years. There is definite evidence that the veins contain



L. E. McMillan

Geological-Survey Food Cache in Alaska; Tin Strips on the Posts Keep the Bears Away

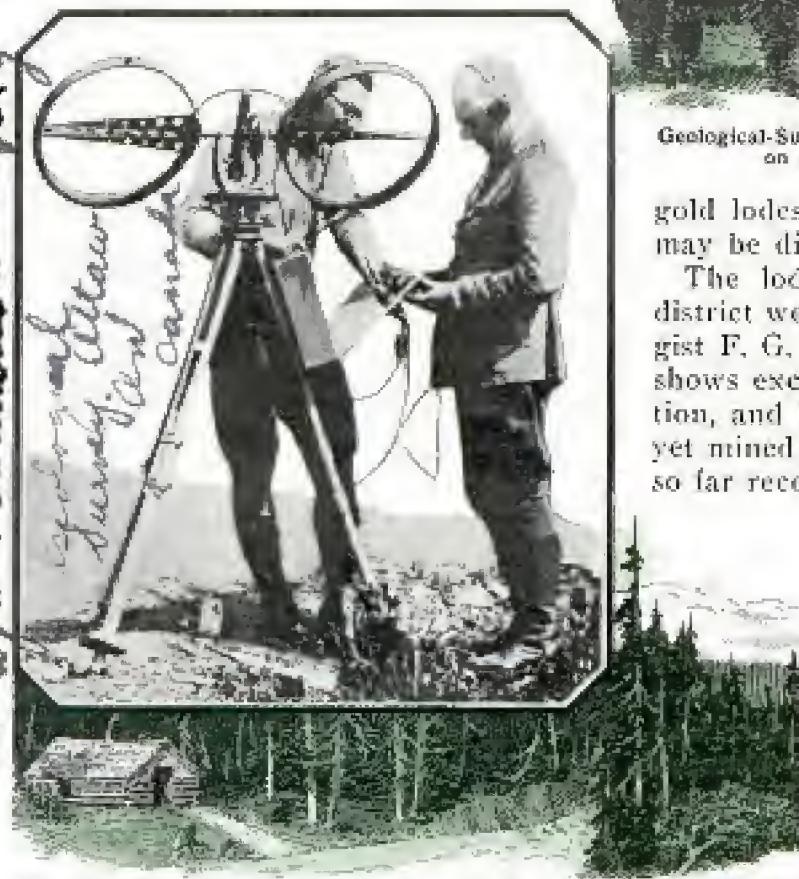
gold lodes other than those now known may be discovered."

The lode prospects of the Kantishna district were examined in detail by Geologist F. G. Wells, who says that "the area shows excellent indications of mineralization, and high probability that veins not yet mined contain ore as valuable as that so far recovered. With the completion of

the automobile road from Mount McKinley national park to the Kantishna district, the cost of operating mines there will be considerably reduced, and the district holds promise for both the mine operator and the prospector."

Geologist C. P. Ross, who examined the lode prospects of the Valdez Creek district, says that "the veins range

from a few inches to three feet in width, and the shear zones are as much as seven feet wide." Some lodes in this area were traced for several hundred feet along the



Radio Ore Detector That Employs a Direction-Finding Method Similar to That Used in Locating the Position of Ships at Sea

primary gold of economic value, to depths considerably below any that have so far been reached. The Fairbanks district as a whole affords large possibilities that many

*Made by Radioore Co., Ltd.
1014 Central Building, Los Angeles, Calif.*

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in making surveys - do not sell.*



outcrop, and some samples, assayed for prospectors, were found to contain \$80 or more in gold to the ton. Ross found, in the area west of the Chulitna river, veins containing "considerable copper, notable amounts of lead and much arsenic." Locally, wide areas of country rock, he says, "carry disseminated sulphides and stringers of sulphide-bearing quartz. A tunnel is now being extended to cut one of the more promising veins at a depth of about 100 feet."

The gold-lode mines of the Willow Creek district were studied in detail by J. C. Ray. The largest lode mine in the railroad belt, the "Lucky Shot," he reports, has installed a new thirty-five-ton mill. In some of the veins mined, there are two and, in places, three generations of quartz, and the close analogy between these veins and those in certain California districts, where mining has been carried to depths of several thousand feet, Ross says, "gives great reason for hope that the gold ore in the Willow Creek district extends to depths far below any that have so far been reached. There is also reason for believing that the district contains many other valuable veins that have not

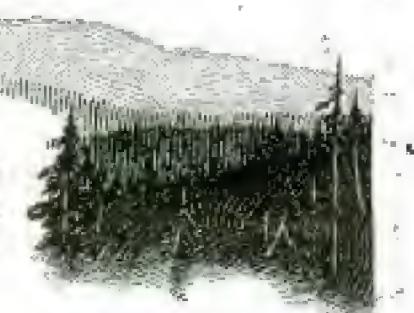


Top, Obtaining Underground Cores with Compressed-Air Unit; Below, Measuring Areas in Airplane Photographs

taken from some of the dikes in the Moose Pass district show the presence of gold in encouraging amounts, and it is possible that portions of some of these dikes may be rich enough to justify mining."

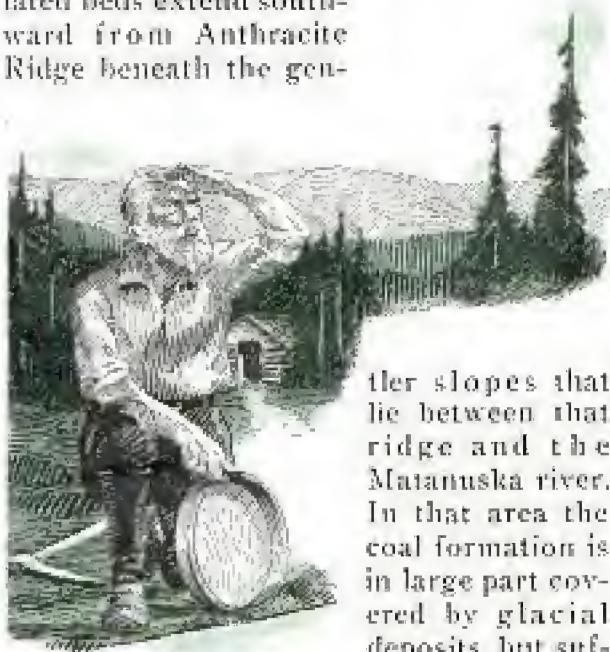
A study of non-metallic resources other than coal in the railroad belt and an examination of miscellaneous metallic prospects that did not lie within the districts already described, were made by G. A. Waring, who found a large number of prospects containing limestone, manga-

yet been discovered." The government geologists found in the Girdwood and Moose Pass districts ore deposits "characterized by the presence of free gold. Their general character and the mineralogic association indicate that primary gold is present, but the general thinness of the veins, the apparently moderate extent both horizontally and vertically of any single vein, the large variations in strike within short distances and the presence of numerous forks and offshoots, indicate that great caution should be exercised in planning extensive developments, and that the wise course, in both prospecting and mining will be to follow the ore shoots closely. Assays of samples



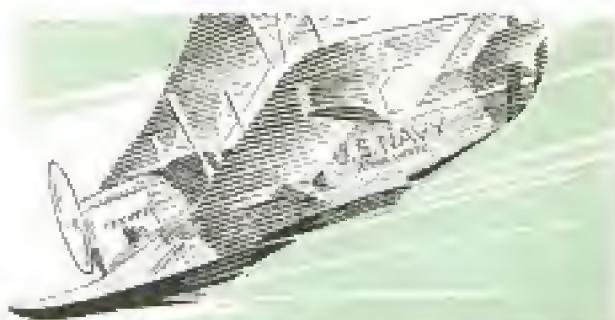
nese and clays of various types, as well as several metal-bearing lodes. None of these are now producing, but as at any time there may be a demand for some of these materials, it was deemed desirable to learn the facts concerning their distribution and quality.

A large-scale topographic map of the more promising portion of the anthracite field in the upper Matanuska valley was made, and a force of laborers employed to open up the coal exposures. Beds were traced on Anthracite Ridge proper that indicate the presence of some half million tons of anthracite, but the coal occurs under such structural conditions and in such a topographic situation that, in itself, it does not constitute a commercially feasible coal field. From geologic evidence, however, the geologists report that "there is a high degree of probability that related beds extend southward from Anthracite Ridge beneath the gen-



tler slopes that lie between that ridge and the Matanuska river. In that area the coal formation is in large part covered by glacial deposits, but sufficient structural

observations on the coal formation were made to indicate the probability that the area contains reserves of coal that may run into many millions of tons."



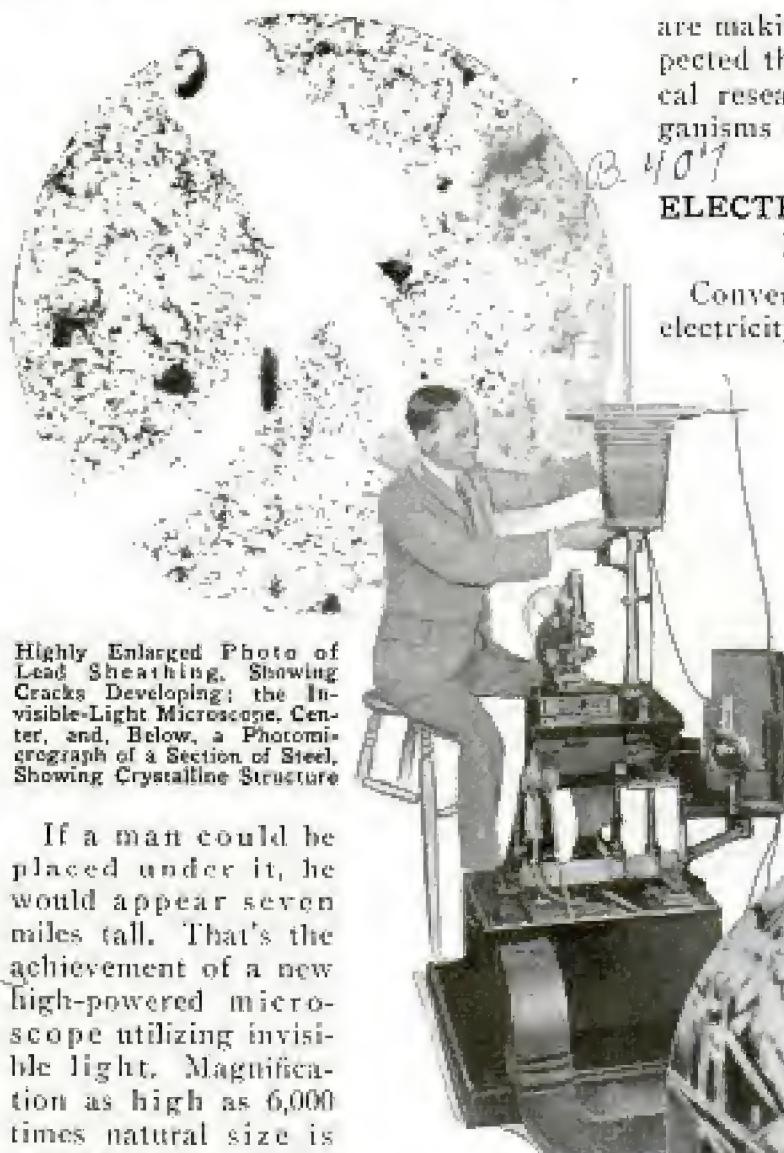
Juneau Gold Mine Which Recently Reported Ore Assaying \$14 of Gold per Ton

The various discoveries of unmined gold in Alaska are regarded as especially significant in view of the present world-wide hunger for gold, as a means of lifting deflated commodity-price levels. Increasing demand is being made upon the geological survey for official reports of both gold and silver explorations in this country, and evidence is accumulating of renewed activity in both abandoned and newly discovered fields in the United States and Alaska.

The growing importance of Alaska as a gold producer is indicated by government statistics, showing that the gold output in the territory in 1930 had a value of \$8,394,000, or about two-thirds of a million dollars more than in 1929.

"This marks a noteworthy increase," declares the department of the interior, "not only over the preceding year but also over any of the preceding ten years. In the entire period during which gold mining has been in progress in Alaska about \$390,000,000 has been won."

Invisible Light Reveals the Secrets of Metals



Highly Enlarged Photo of Lead Sheathing, Showing Cracks Developing; the Invisible-Light Microscope, Center, and, Below, a Photomicrograph of a Section of Steel, Showing Crystalline Structure

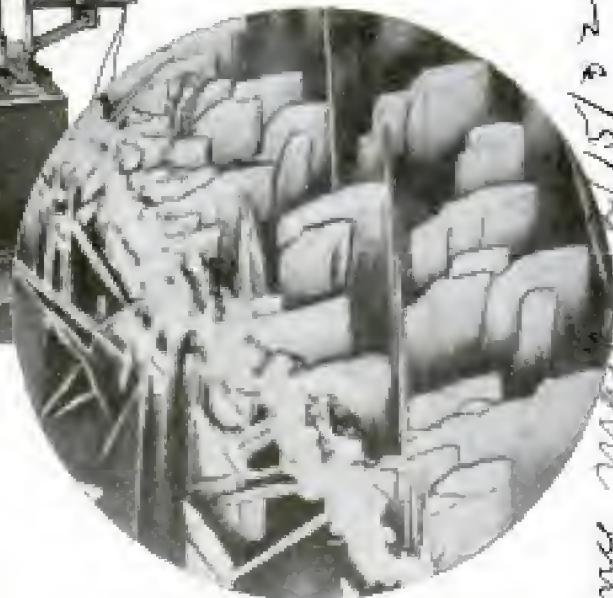
If a man could be placed under it, he would appear seven miles tall. That's the achievement of a new high-powered microscope utilizing invisible light. Magnification as high as 6,000 times natural size is possible and many secrets of metallurgy have been revealed as the result. The operation is extremely difficult, adjustments as small as one hundred-thousandth of an inch being required in the lens movement. Although the ultraviolet-light scope was invented more than thirty years ago, its effectiveness was not realized until engineers of the Western Electric company developed a special technique in seeking the reasons for the cracking of lead sheathing on telephone cable. Many further researches in metals have resulted. It was found the cable sheathing cracked because the antimony used as an alloy did not flow evenly. Another discovery resulted in the strengthening of telephone dials so they will serve for 5,000,000 operations instead of the former 100,000. While metallurgists

are making these new discoveries, it is expected the microscope will also aid medical research by photographing microorganisms of extremely minute thickness.

407

ELECTRICITY TAKEN FROM SUN BY TUBELESS CELL

Converting light directly into useful electricity, a new type of tubeless photoelectric cell has been developed. The cell costs less to manufacture, is said to possess unlimited life, high sensitivity and undergoes no chemical or physical change. A relay to actuate electrical machinery can be run directly from the cell without any other current source. The cell is metallic in structure, and, because of its simplicity and low cost, is expected to come into general use for



the control of household devices and for experimentation by amateurs. It gives 200 times as much current for a given amount of light as any previous cesium cell and ten times that of the copper-oxide cell. In direct sunlight a current of one two-hundredth of an ampere is obtained. While there is no immediate prospect of utilizing the new cell in a commercial way, it is said it is the most efficient direct converter of solar energy thus far known.

Weston Electrical
Instrument Corp., 919
Frelng baysen, Newark, N.J.
Copy right reserved

Western
Electric Co.
for Cell research
in Church St. New York

Mr. Paul D. Merica
V.P., International Nickel Co.
67 Wall St., New York

B. 399

POPULAR MECHANICS

SOFT METALS ARE MADE
HARD AS STEEL
BY AGING B. 449

Metals and alloys hitherto considered too soft for mechanical purposes, have been made as hard as steel by a process of age-hardening. Steel long has been considered practically the only metal that could be hardened and strengthened by heat treatment. Now other metals, such as copper, lead, tin, zinc, aluminum and nickel, some of which resist corrosion and conduct electricity better than steel, can be made just as useful in the mechanical field.

The process hardens copper to a point comparable with spring steel. The system depends upon the fact that, properly alloyed, the non-ferrous metals will harden as they grow older. Often a single day is sufficient, although certain changes may continue in lesser degree for a month. The age-hardening is really a form of atomic precipitation, the particles that form the hardening "binder" being actually manufactured by the alloy or the metal itself.

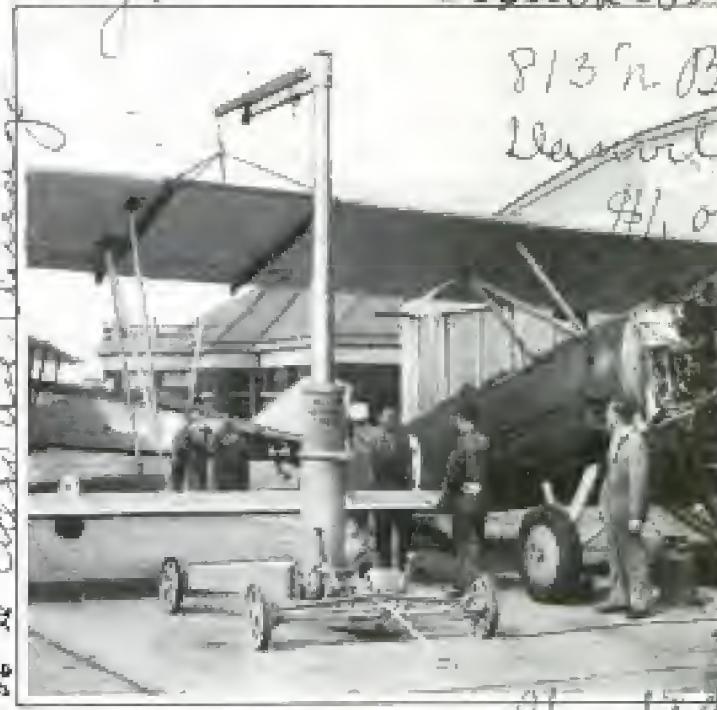
B. 381
GOLFER FOLLOWS BALL IN CAR RUN BY ELECTRICITY

Following the ball in an electric auto, a California golfer has covered more than 2,000 miles on the fairways. The player rides from stroke to stroke. Unable to walk the full eighteen holes, he had the car built for use on the links.



Built Especially for the Golf Course, This Electric Car Carries Its Owner around the Links

Curtis M. Willock
Pasadena, Calif.



One of the Uses to Which This Portable Hydraulic Hoist Can Be Put at Airplane-Repair or Assembly Port

B. 221
HYDRAULIC ARM SWINGS WING OF PLANE INTO PLACE

Airplane wings and engines as large as 575 horsepower are quickly dropped into place by a portable hydraulic hoist recently put into service at an air-transport base in Chicago. The hoist is wheeled and can be pulled into position at any point on the concrete apron. The hydraulic mechanism is actuated by an electric motor and the column, in three sections, can be raised to a height sufficient to handle the top wings of even the largest transport craft. Much time is saved in plane repairing and assembly through its adoption.

B. 449
CRYSTAL FLASH-LIGHT BULBS MAGNIFY RAYS

Flash-light bulbs of a crystal capable of standing almost any sort of knock or blow without breaking, have recently been developed. The top of the bulb looks like a solid glass and serves to magnify or concentrate the light. Tests show that it will burn twenty-seven to twenty-nine hours with one set of batteries. The bulb comes in various sizes to fit all types of lights. One of the interesting features of the lamp is its adaptability to surgical use, for it can be sterilized just as any other of the surgeon's instruments.

B. 4431
**Flash Light Bulb +
Battery Co. Copyright material
n. Racine Ave Chicago**

B. 18 4

802

POPULAR MECHANICS

Beauty of Made Islands Revealed from Air



W. G. W.
Some of the Man-Made Islands near Miami; Note the Henry M. Flagler Memorial, a White Shaft in the Center; an Unusual Regularity of Shoreline Is Revealed in This Picture Taken from an Airplane

Beauties of the man-made islands along the causeway connecting Miami Beach and Miami, Fla., are revealed most clearly from the air. The Henry M. Flagler memorial shaft, on Star island, stands out plainly in airplane photographs. A striking feature of the islands is the regularity of shoreline, the result of man's hand.

FUEL FUMER REPLACES CHOKE TO MAKE STARTING EASY

Electric atomization of the gasoline to make starting easy is the object of an accessory recently developed for installation on any make of car. The device is connected with the inlet manifold above the carburetor and a switch mounted on the dash. When the operator desires

to start the engine, he pulls the switch just as he would a choke. The current opens a double-acting magnetic valve, allowing intake of both air and gasoline. As the engine turns over with the starter, the fuel and air are drawn into a fuming chamber where they are heated by electricity and enter the cylinders as a cloud of highly volatile vapor, instead of in more liquid form, as is the case where the conventional choke is employed. The valves close and the heating element cools as soon as the switch is released.

EXPLOSION HAZARD IS REDUCED IN FUMIGATING WHEAT

Fire and explosion hazards have been reduced by a new fumigant for wheat developed recently by the department of agriculture. This fumigant contains a mixture of ethylene oxide and solid carbon dioxide in proportions of one to ten, and is entirely successful and safe.

C. Roger Hawthorne,
333 N. 1st St.,
Washington, D. C.
Supply nonflammable material

Pines Winterfront Co.
1135 N. Cicero Ave.
Chicago

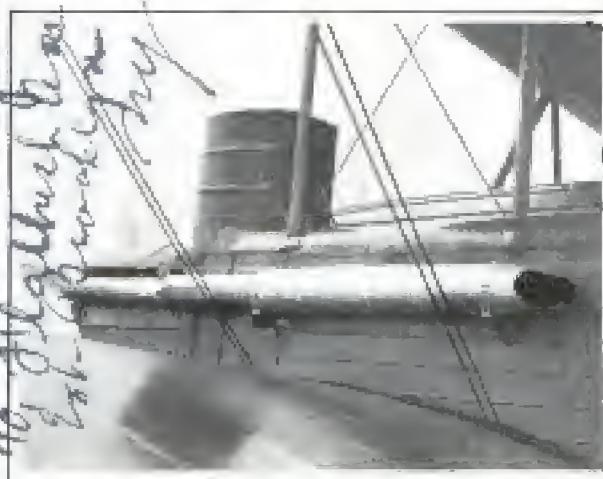


CARILLONS REGULATED BY DIAL TO BE JUST LOUD ENOUGH

Electric carillons can be regulated to give forth exactly the tone and volume needed by merely twisting a dial like controlling the volume of sound from a radio. Heretofore bells often were too loud for the comfort of those near such carillons, but it is now possible to make tests over an area and determine exactly how much amplification is necessary for the carillon to be heard at any specified distance, then regulate the bells accordingly. For instance, it is possible to regulate a carillon in a park so it will not be heard outside the park, but on special occasions the volume can be increased so it may be heard for miles. The same instruments can be used to determine the distance over which whistles and sirens can be heard.

MUFFLER STOPS PLANE NOISE BY WEARING IT OUT

B3 22
Literally wearing out the exhaust gases by making them travel through forty-eight feet of spiral tubing, a muffler for airplanes has been developed that not only ends engine noise but does so without back pressure and consequent loss of engine efficiency. The external length of the muffler tube is only five feet, making it adaptable to any airplane. The spiral curves in the muffler body not only reduce the air



Exhaust Silencer Installed on Transport Plane; Streamlined Turret Houses Radiator

plane noise but provide two and a half times as much cooling area for gases. Elimination of noise has been particularly desirable in passenger service.



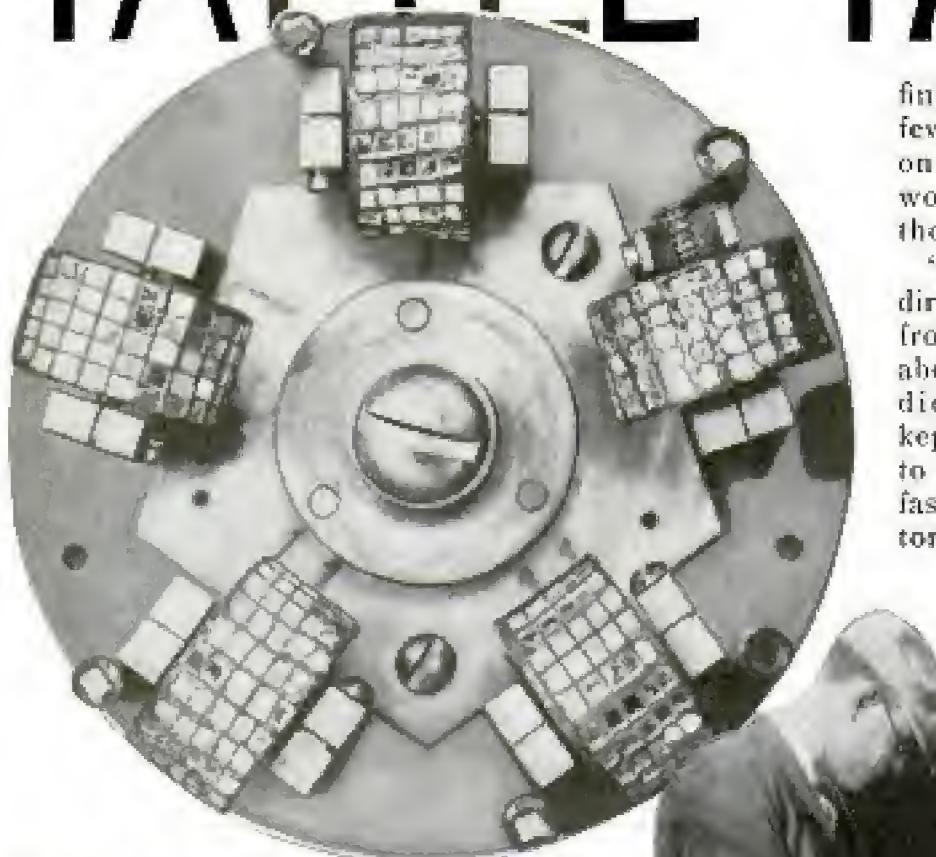
Disk Sander That Saves All Hand-Scraping on New Floors or Removes Varnish

FLOORS SANDED TO BASEBOARD WITH DUSTLESS TOOL

For the many operations where a portable power sander and grinder is necessary, but where dust is a fire hazard or health menace, there has been developed a machine incorporating in its makeup a vacuum cleaner which picks up all residue. Edging floors is one such operation where the tool is particularly applicable. The edge can be sanded right up to the baseboard, doing away entirely with hand scraping. When properly handled, the tool is so powerful it cannot stall. A special disk is supplied that removes varnish, while the edges of new floors are smoothed to a fine finish as fast as the sander can be moved by the operator. The disk is seven inches in diameter and travels at 3,200 revolutions per minute while cutting, and any degree of finish can be obtained by regulating the grades of abrasive. Disks are quickly removable by turning one countersunk screw, for which a socket wrench is supplied. The tool is fitted with two handles, in one of which is the double-throw toggle switch. It weighs twenty-one pounds and is powered by a one-horsepower motor.

Porter-Cable-Hatchinson
Corporation Syracuse, N.Y.

TATTLE-TALE



Mirror Head of Oil-Well Survey Machine; the Rotating Mirrors Reflect Light on Photographic Film

650 By JOSEPH D. MOUNTAIN
Lummick Drive, Los Angeles

TATTLE-TALE machines that spy on conditions at the bottom of oil wells are making drilling simpler, safer and cheaper. These sensational machines, the water witch, the core drill, the survey machine, the "go-devil," the drilling-weight indicator, the steam-flow meter, and the mud-weight indicator, are all recently developed eyes for the driller.

Rotary drilling, which has brought black fortunes from depths of nearly two miles, also has brought many difficulties unheard of in the older method of cable-tool drilling. The twisting auger action of the rotary bit causes an effect which old-time drillers find hard to believe and still harder to correct.

"I was drilling a hole for a little company that didn't think they could afford a weight indicator, surveys, or any of the modern helps for the driller," a veteran oil man said. "But they found out before we

finished that well that a few hundred dollars spent on scientific instruments would have saved them thousands.

"Because an offset well directly across the road from us started drilling about the same time we did, our superintendent kept after us all the time to drill our hole down faster than our competitor was going. Although

I've learned that in oil-well drilling, like in many other things, 'haste makes



The Bow Represents a Curved Oil Well; the Shadow, the View Seen from Above Such a Well

STEEL BRAINS



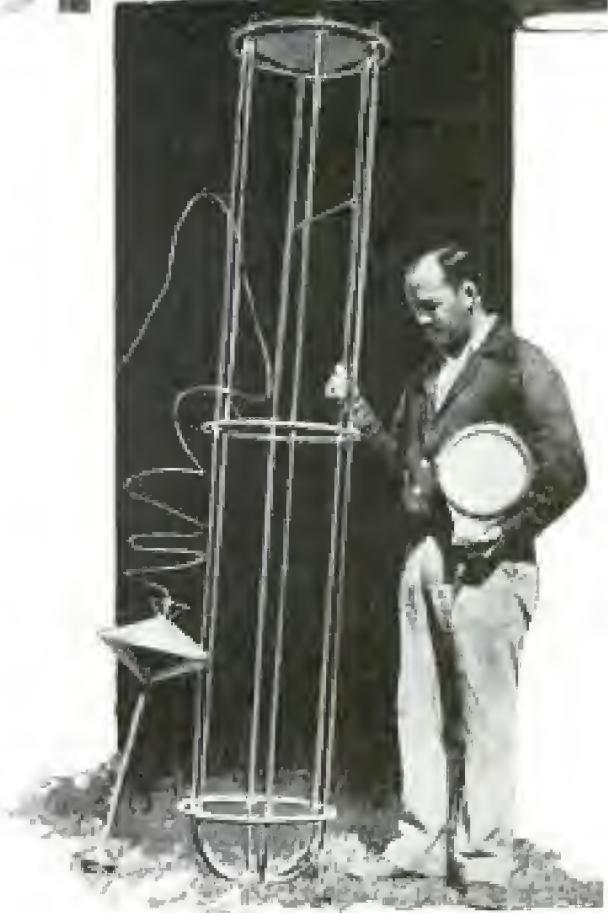
Top, Crew Orienting Drill Pipe in Rig; Right, Apparatus Revealing Consistency of Drilling Fluid

waste,' I had to crowd weight on the bit to keep the superintendent satisfied.

"They are 200 feet ahead of us," he would say, "bear down on that bit!" From the very start we had difficulty, but our first serious setback came at about 2,000 feet. The bit was rotating on bottom with about all the weight it would stand, when, all of a sudden, the engines started to race. I yanked the throttle shut and eased off the brake a little to let the bit down a few inches. Then a touch of the engines told me that we had a twist-off. The terrific strain on the pipe had been too much for it.

"Out of the hole!" I yelled to my roughnecks. But I knew, while we were taking out the parted drill pipe, that, even if we fished out the lost bit in record time, our troubles were only beginning.

"We had six twist-offs before we got that well down to the sand," the driller said. "The outfit across the road drilled into the oil sand and had their well producing before we set the casing. Our well cost more than twice as much as the one which had been drilled slowly; ours took longer to complete and never got as much production."



"The super called it tough luck, but I knew better. Our trouble was frenzied haste and lack of modern instruments. Our well was so crooked that it always



Alexander Anderson and His "Go-Devil" for Surveying Oil Wells; It Is Dropped Inside the Drill Pipe and Brought Out of the Hole with the Dull Bit; It Is Here Shown Being Tested.

gave trouble and made expense." Crooked holes are not only expensive and troublesome. Often dry holes are situated directly over the oil, but the hole wanders so far it misses the oil. The underground oil-well survey is preventing that by keeping the driller informed at all times of the exact location of the bottom of his well.

An oil company in California recently drilled a new rotary well within a few feet of an old one which had been drilled by cable tools. The old well, churned to a depth of 2,300 feet into the oil sand, had always been a good producer. The new well was drilled to the same depth but no oil was found. On and on, several hundred feet deeper, the drill bored until finally the well was abandoned as dry. Subsequent surveys by one of science's underground stool pigeons showed the bottom of the well had drifted 450 feet. This inclination had caused the bit to miss the oil-bearing formation entirely.

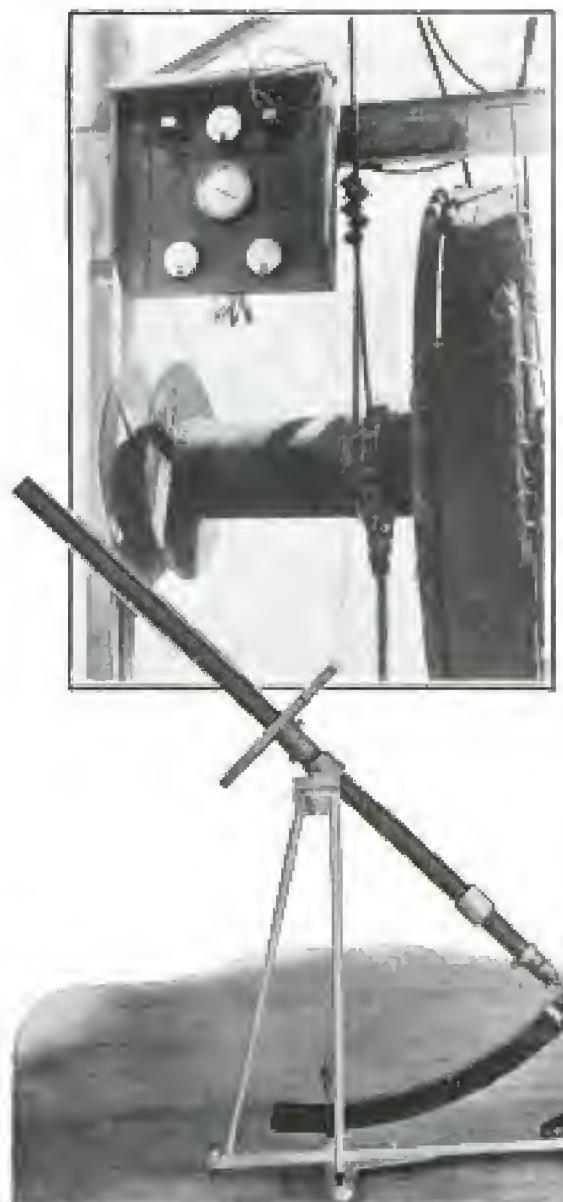
Although the acid bottle has been used for years in determining the inclinations of diamond-drill prospect holes, only recently has a method been developed of rapid, cheap and accurate surveying of oil wells. There are several different types of

instruments. Although working on different principles, all of them are designed to measure the angle of inclination of the well from the vertical. Some of the instruments also measure the direction of this inclination. One of the most successful of the latter type was invented by Alexander Anderson, of Fullerton, Calif. It is a photographic machine which is sent down on the end of the drill pipe. This instrument makes a survey of the inclination and direction of the well every ninety feet, giving the engineers sufficient data from which to plot an accurate plan and elevation of the well. Another type, called the "go-devil," is dropped inside the drill pipe and brought out of the hole with the dull bit.

Holes have been drilled with an inclination at the bottom sixty degrees from the vertical and with the bottom drifted as much as 2,100 feet in a well 4,600 feet deep. This deviation is a source of unending trouble and expense. One operator in the Long Beach, Calif., field had drilled to a depth where he thought he would find oil. Unable to get his well surveyed until the following day, his impatience made him run \$17,000 worth of casing into his hole.

When Mr. Anderson surveyed the well, he found that at the bottom it was inclined thirty degrees from the vertical and that the formation at that point was also inclined thirty degrees. The well was drilling exactly parallel to the oil sand and a little above it. No amount of drilling would ever bring that well into the pay sand. Had the well been surveyed at intervals during its progress, thousands of dollars would have been saved and a dry hole made a producer.

Missing the oil formation is not the only loss caused by crooked holes. Wells have run together destroying each other. Drilling wells have run into producing wells letting water into the formation, destroying the producer and sometimes damaging



Top, Oil-Well Surveyor's Loading Room; Center, Dials Showing Driller Conditions in Well; Below, Testing Accuracy of Oil-Well Survey Machine



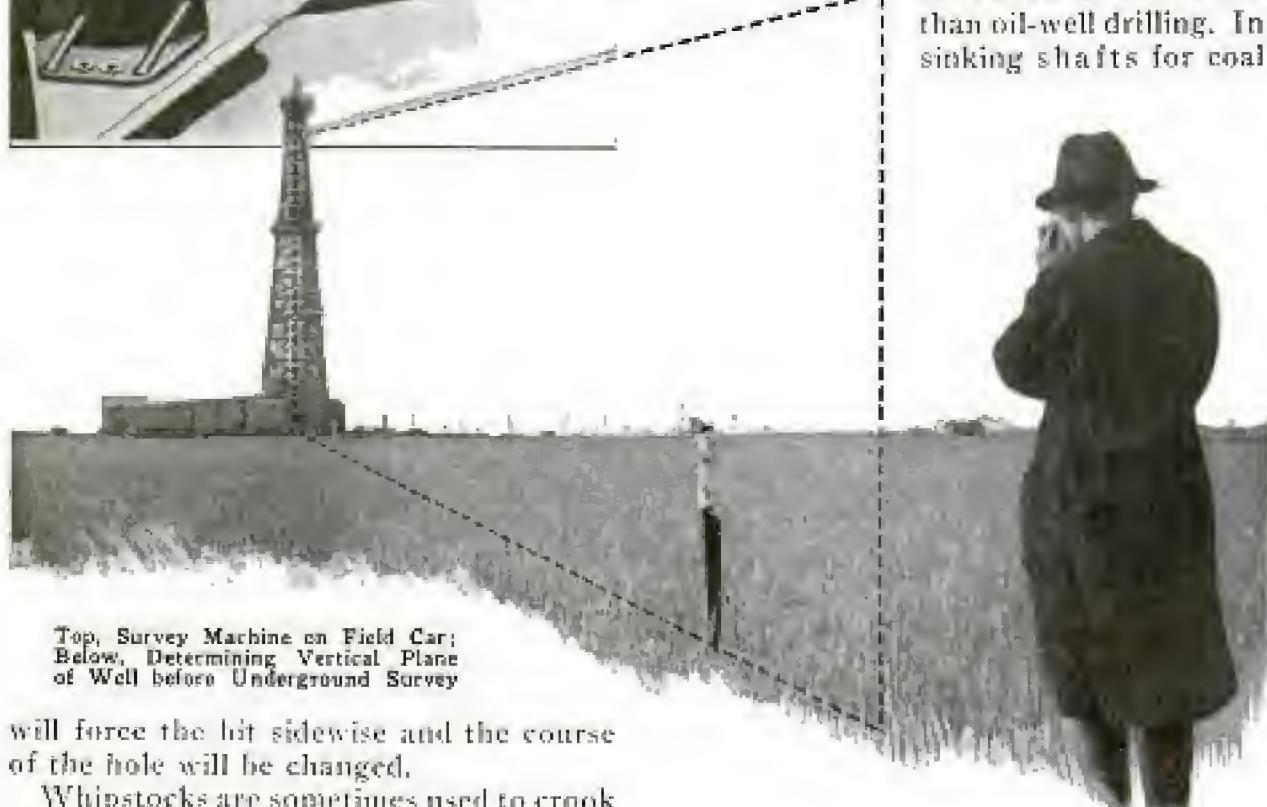
the entire field. Unreliable interpretation of core samples taken from the bottom is caused by crooked wells. Twist-offs are usually caused by the pipe rotating in a crooked hole. Every rotation of the pipe causes it to bend back and forth, fatiguing the metal and finally causing it to break and drop the string of pipe and bit to the bottom, resulting in a costly fishing job.

Crooked wells, if discovered in time, may often be straightened. A whipstock, which is a wedge built up of pipe, is placed in the hole with the face of the wedge toward the direction the well is to be deviated. When drilling is started, the wedge





Top, Survey Machine on Field Car;
Below, Determining Vertical Plane
of Well before Underground Survey



will force the bit sidewise and the course of the hole will be changed.

Whipstocks are sometimes used to crook a hole deliberately, making it penetrate a formation not directly below the operator's property. A large cemetery in the middle of a California oil field prevented tapping an important oil pool; therefore, those companies near the edge of the cemetery tried to direct some of their wells so they would end below it. Some unscrupulous drillers, unable to obtain land favorably located on an oil structure, get leases as close as possible, then by using whip-

stocks or other means try to direct their holes into the oil sand.

Nearly all wells pass through water-bearing formations on their way to the pay sand. Before the well is brought in, this water must be sealed off by cementing the space between the casing and the wall of the hole. Failure to make this water shut off perfectly has made paupers of many oil operators and has ruined many promising oil fields by letting salt water into the oil sand. To determine the exact point where salt water enters the hole was impossible until the recent invention of the "water witch," another underground tattle-tale. It is an electric instrument that depends on the change in resistance of the fluid in the hole because of the presence of salt water. Many of these new instruments find application in other fields than oil-well drilling. In sinking shafts for coal

mines in England, Belgium, and the north of France, the underground survey greatly facilitates the work. Especially along the coast of Dover, the coal is overlaid by the green sand which outcrops in the sea. Salt water fills the sand formation, rendering impossible sinking of the shaft by ordinary methods. Two methods have been used with considerable success for getting through this layer of porous, water-laden

sand. By using enormous drills, twenty feet or more in diameter, the shafts are sometimes drilled to the coal much as an oil well is drilled. The other method is to drill a number of small holes, two to three inches in diameter, around the site of the shaft. A freezing solution, such as ammonia, is circulated through pipes in these holes. This solidifies the ground in the vicinity of the shaft, enabling the miners to dig it in the usual way. Before the ground is allowed to thaw, the shaft is cased with iron.

Because of the close spacing of the holes used for the freezing pipes, practically no deviation can be permitted. Here the underground-survey machine keeps careful watch and reports the slightest deviation of the hole from vertical.

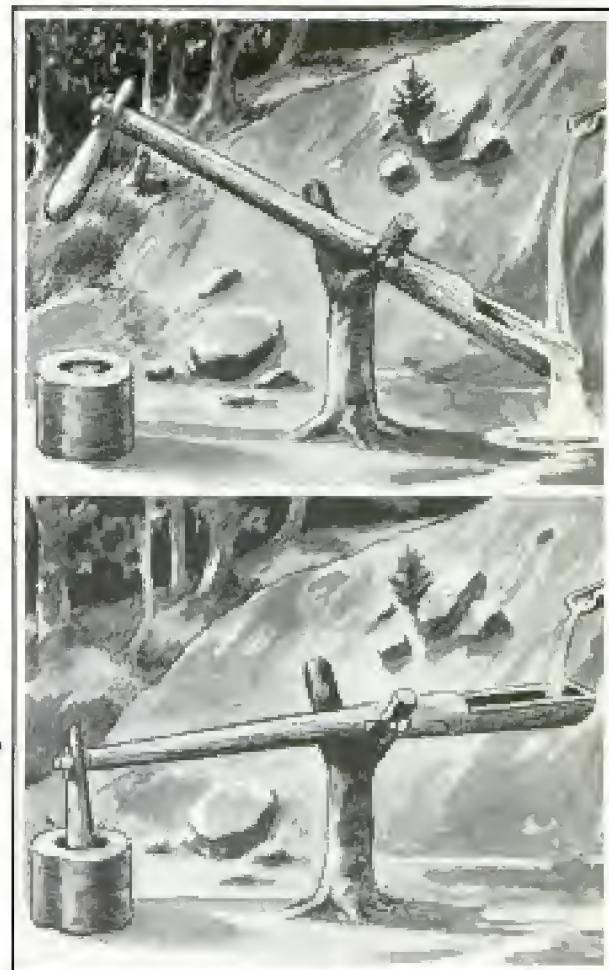
RUBBER EDGE FOR PLANE WING PREVENTS CUTTING

Airplanes now are being fitted with rubber abrasion shoes to prevent damage to wings and tail as a ship flies through rain, snow and sleet. These shoes consist of strips of rubber attached to the leading edges of the wings and tail surfaces. They are similar to the ice-breaking equipment known as rubber overshoes for planes, but they contain no inflation tubes. It was found that the rubber resists the elements better than steel, wood or canvas.



Rubber Shoe for Airplane Wing, Which Prevents Damage to the Edge from Snow or Sleet

B.F. Goodrich Co.
Akron, Ohio



Crude Form of Corn Mill Run by Water Power; It Is Entirely Automatic in Its Operation

SEESAW CORN MILL OPERATED BY WATER POWER

southern pearl
Crude but highly efficient, a small seesaw grain mill has been built by a North Carolina farmer and operates automatically, the only attention required being the feeding or removal of grain. In a crotch of a tree, a beam was balanced on a wooden peg extending through the beam and into the forks of the crotch. On one end of the beam is a rudely fashioned pestle hanging over a mortar below, formed of a hollowed-out poplar stump. The other end of the beam was hollowed out to form a trough and from a near-by stream water was piped to fall into this trough. When the trough is full, it drops down, dumping the water. Relieved of its burden, the beam is carried down by the weight of the pestle which strikes the corn.

Caribbean
Recent soundings have disclosed a depth of 24,000 feet, or nearly five miles, in the Caribbean sea.

by submarine I-48
in "Bartlett" deep material
and of Cuba

B. 235 cont'd. C. Moran, 3825/130
810

POPULAR MECHANICS

Uncle Sam as Pearl Diver Plants Oyster Beds



Top, Native Diver Bringing Up Ten-Pound Pearl Oyster; Center, Resting between Dives; Right, Donning Steel Helmet for Descent.

In Kaneohe bay, near Honolulu, there is an experimental bed of pearl oysters that the Hawaiian government believes will form the basis for a commercially profitable industry. The oysters were planted there more than a year ago, following a dramatic exploration by the United States navy and the bureau of fisheries, and already have doubled in size. The story goes back to a rumor heard by Hawaiian officials that a native fishing company for nearly two years had been taking pearl oysters of rare species and value out of the waters near Pearl and Hermes reef, some 1,300 miles from Hon-

olulu. The gossip was disbelieved, for the reason that pearl oysters had never been known to exist in those waters. But the rumor persisted. Investigation disclosed that the native fishing company, having accidentally discovered the beds, had, in fact, fished out more than \$100,000 worth of pearls and pearl shells. Were these beds within the territorial limits of the Hawaiian government? That question, even now, has not yet been determined legally. The fishing company would not divulge the location of the oyster beds, and the Hawai-



ian officials appealed for help to Washington. A navy ship was outfitted with diving apparatus, under-water motion-picture camera, water and sea-bottom sampling devices, and set out for the islands. Arrived at the reef, there followed weeks of bottom sounding and diving; then, one

B 235

POPULAR MECHANICS

03-59 Jan 30, 220
State of
Chicago

811

FINGER FOR DIAL TELEPHONES
MAKES OPERATION EASY



Pencil for Operating Dial Telephones Is Shown in Place; It's Easier than Dialing with Finger

ROTARY PLOW TO AERATE SOIL
HELPS FERTILIZE IT B 330

Farmers and agricultural experts in England recently witnessed a demonstration of a rotary plow and cultivator that picks up the soil and throws it back in a cloud, reminiscent of a rotary snowplow in some mountain pass. In one operation, the plow pulverizes the soil, aerates it, assists in conserving its moisture and cuts up any surface growth into small pieces, distributing them evenly with the soil to aid fertilization. It is operated by small-power tractor and plows unusually wide.

Cultivator

Cultivator



Throwing a Cloud of Soil behind It, This Rotary Cultivator Looks Like a Snowplow

Socete Anonyme
Austrie Compagnie
Thames Road, Chiswick, W. 4

LONGER LIFE FOR SPARK PLUGS
IS SOUGHT IN HEAT TESTS B 358

Longer life for spark plugs is sought in Bureau of Standards tests on materials less affected by heat than mullite, the principal substance used in making the plugs. Several mineral compounds, including cordierite, beryl, zinc silicate and barium feldspar, expand less under heat than does mullite. Cordierite and beryl expand less than fused quartz at temperatures below 270 degrees Fahrenheit. And quartz has a number of specialized uses, such as in optical instruments, because it responds to heat so little. Spark plugs of one of these materials would last longer, since there would be less cracking.

A. J. Essteller, in report to
American Ceramic Society



Creel Strap Which
Permits Carrying Bas-
ket on Back or Side

ADJUSTABLE STRAP FOR CREEL MAKES CARRYING EASIER

When a fisherman reels in his line at the end of a lucky day and notes with satisfaction a full creel, his elation usually is tinged with regret if he is forced to carry the filled basket suspended at his side for any considerable distance, because he finds the holder cumbersome and unwieldy. An adjustable creel strap now is being offered to make the carrying easier. When fishing, the angler carries the creel at his side in the usual manner. When he is through, however, he loosens the strap and buckles it in a different manner so that the basket can be carried on the back.

DRILL-PRESS TABLE WITH VISE CUTS TIME IN HALF

Several interesting and timesaving features are incorporated in a drill-press table recently developed. The table is built of steel plating, electrically welded, and includes a vise with a five-inch drop for holding work. The table top can be rotated on the tilting arm and locked at any point. It also can be tilted to any degree, making it possible to drill a hole at the proper angle, and is quickly locked in position by one lever. Through the use of the table, it is said, one man can do the work formerly produced by two.



and more safely. The work to be drilled is held in the table without bolts, although the table is not a jig and is designed for use with drill presses only.

MOST ECONOMICAL CAR SPEED BY FORTY MILES AN HOUR

Driving an automobile at sixty miles an hour costs three or four times as much as at forty miles. This is the conclusion reached by the Chicago Motor club as the result of recent tests. The experiments showed that oil consumption at fifty-five miles an hour is seven times greater than at thirty-five; tire wear at fifty miles an hour twice that at forty, and gasoline consumption at fifty-five miles one-fourth greater than at thirty. For driving on the open road, the tests indicated that from forty to forty-five miles an hour is the most economical speed.

Herald Examiner 2/2/37

INSECT REPELLENT ON WRIST IS WORN LIKE A WATCH

B-286

Carried on the wrist like a watch, an insect repellent in tube form is now on the market, offered especially to the hunter and fisherman. The repellent drives away mosquitoes and other pests. It is applied to hands, face and other exposed parts by loosening cap and pressing tube. Attached to the wrist by a strap, the tube is always handy for immediate use. Its makers claim that it will not stain clothing nor injure the tenderest skin.

B-432

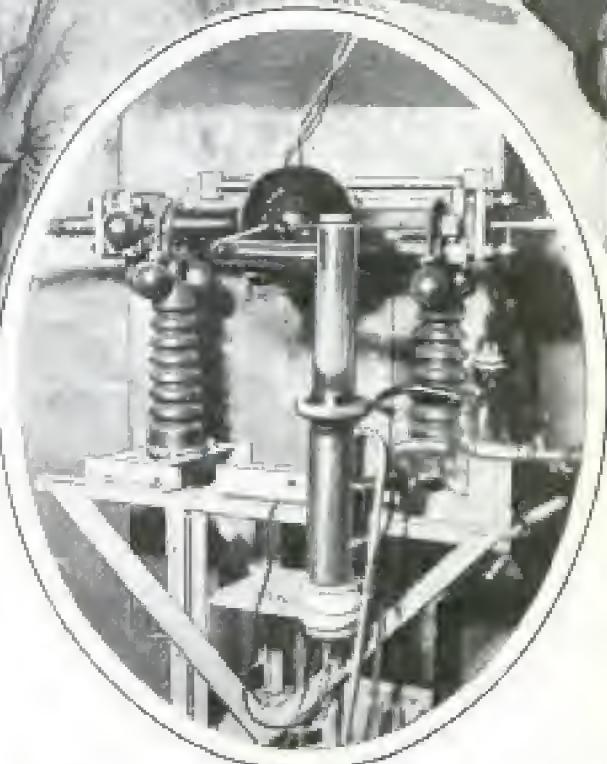
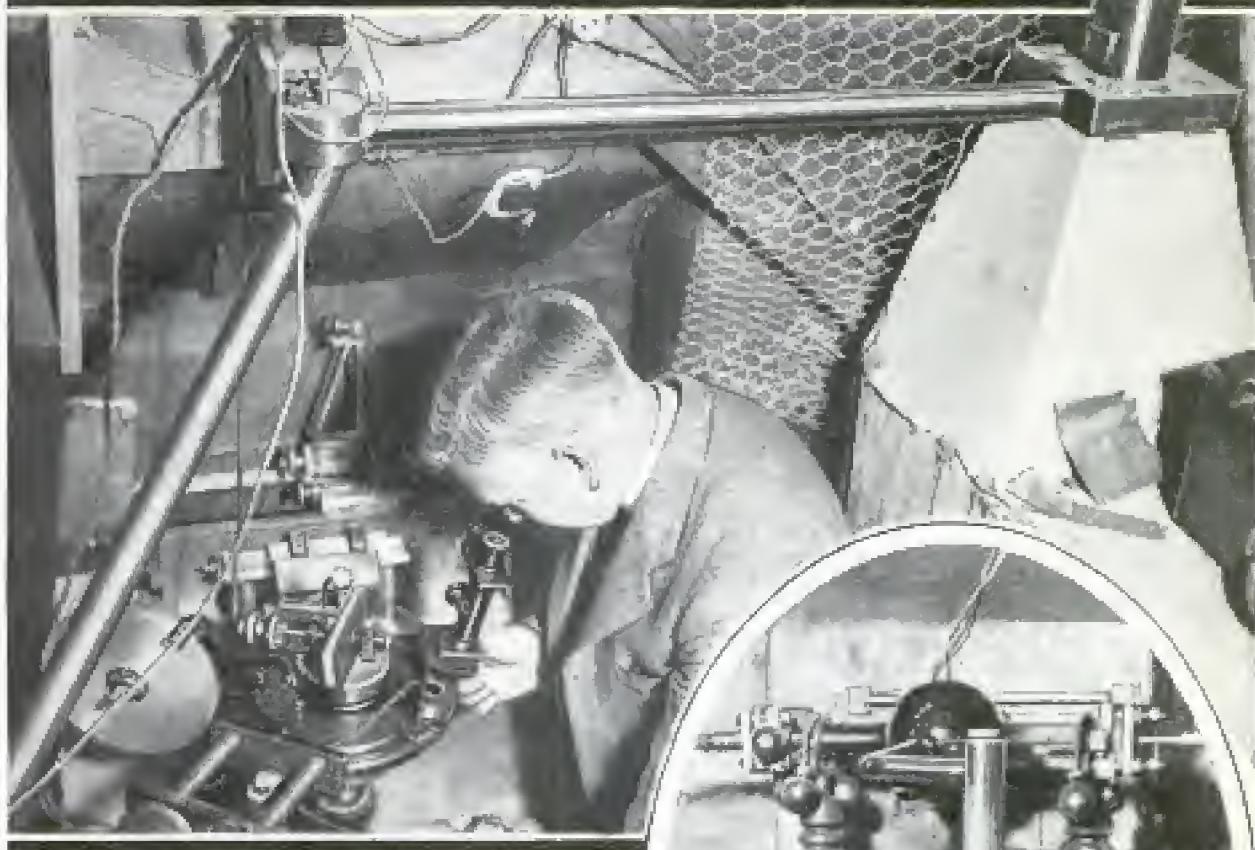
SOUND WAVES HELP X-RAY

It has been found recently that it is possible to take clearer X-ray pictures of parts of the human body after these parts have been exposed to sound waves from a large loud speaker. The speaker unit emits a sound of constant pitch and of sufficient volume to create a perceptible vibration. X-ray photographs taken before and after such vibrations show the latter are much clearer.

*Orca Victor Co
Camden, N.J.*

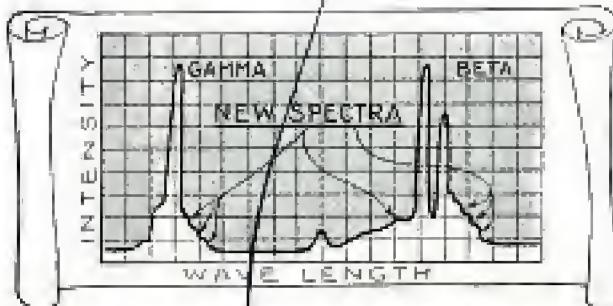
B 299 Mr. William A. Edwards 1130
Bryant St. Palo Alto, Calif

Science Finds New Spectra



EVERYONE ponders over the mysteries of the world; what makes up the earth; why it is so? Just now the eyes of science are directed on the four metals, silver, rhodium, palladium and molybdenum, and Dr. R. A. Russ, of Leland Stanford University, has developed an X-ray apparatus so sensitive that a whole series of lines heretofore invisible now appear in the spectra of these metals.

A piece of metal introduced into an X-ray tube gives off a spectrum, and it is by these lines that the scientist can iden-



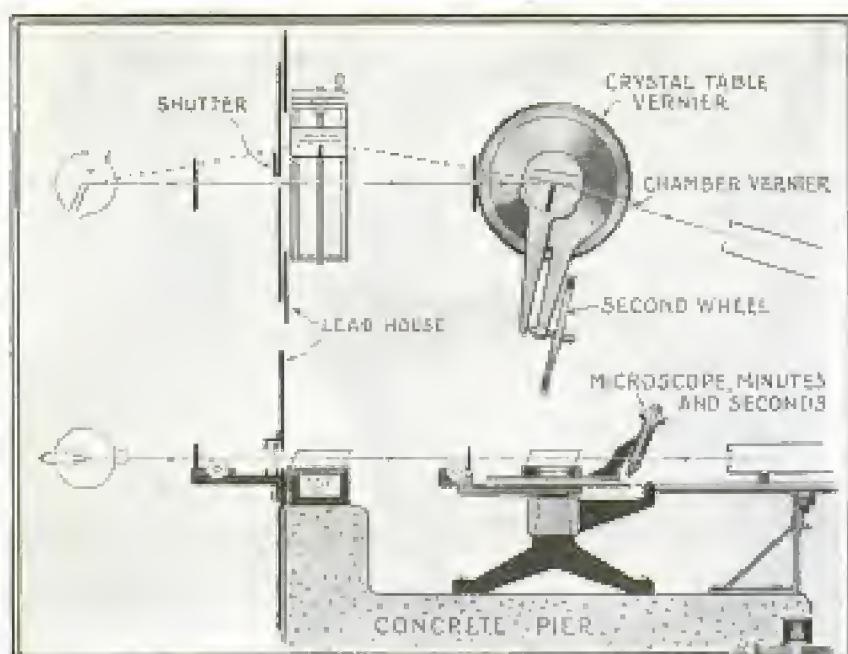
Plotting Intensity of Spectra against Wavelength Reveals the New Lines in This Graph

Top, Spectroscope Which Has Revealed New Lines for Certain Metals; Below, Inside of Lead-Walled Room Housing X-Ray Tube

tify the metal, for each gives a different spectrum. Thus, if the composition of some metal is not known, a small piece is analyzed by this method merely by placing the metal in the tube as a target on which the rays fall, and the spectrum it gives may be compared with known standards to establish its identity.

As can be seen from the accompanying graph, examining the various wavelengths

Stanford P. C.
Calif



Above, Diagram of the New X-Ray Spectroscopic Receptacle Developed by Prof. P. A. Ross; Below, a Photographic View of the Instrument Assembly

of the X-ray spectrum of a metal shows a marked increase in intensity at certain definite wavelengths. These lines have been observed for some time, but with more delicate apparatus Prof. P. A. Ross has opened a new field for investigation. The new

lines are companions to the gamma and beta rays. This is the prediction of H. E. Taylor, executive of a fishing industry, who says that the oceans have become a reservoir of accumulated wealth of chemical materials that makes the resources of the land appear insignificant. This wealth is a challenge to daring chemists to find ways and means of winning it back from the sea.

The target is water-cooled more effectively in the new apparatus by means of a high-pressure pump in much the same manner as an automobile engine is kept cool. This makes it possible to use a much higher voltage in the tube than before. The power consumed runs as high as three kilowatts—more than twice as much as could be used with the old cooling system. The potential runs as high as 100,000 volts at times.

This tube and auxiliary apparatus is contained in a lead-walled room to protect the operator from the effects of the rays which cannot pass through lead because of its great density. Through a peephole in the lead wall, the metal target

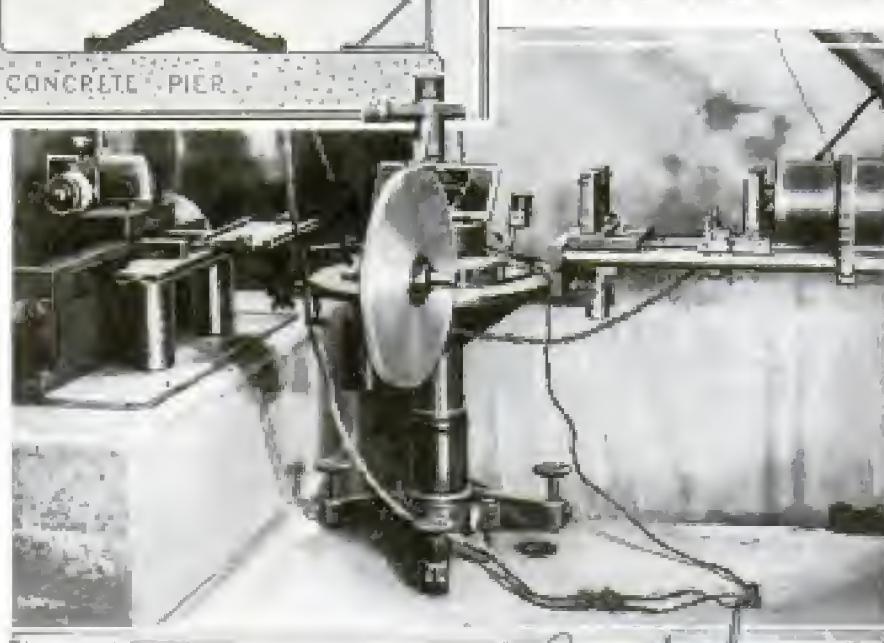
and means of winning it back from the sea. Of the ninety-two chemical elements, forty-seven are found in the sea in solution in water, in tissues in plants or animals, or in bottom sediment. Few of these are now recovered for use by man. At present, salt, iodine, bromine, magnesium chloride and magnesium hydroxide are the principal substances being taken from the ocean in quantity because they can be separated from the water by such simple and cheap processes as evaporation and precipitation.

is observed by means of Doctor Ross' very delicate apparatus.

B-49

SEAS OFFER GREAT RICHES TO FUTURE GENERATIONS

From its inexhaustible storehouse of wealth, the sea will supply future generations with useful substances of all kinds from precious metals to essential elements of the diet and common chemi-



New York

*Press, The Atlantic
Coast Fisheries Co.,
111 John St., New York*

Science Service mail

1/6/32

POPULAR MECHANICS

H. B. Rogers

Portsmouth, Va.

815

B-278

EVIDENCE OF UNKNOWN RACE UNEARTHED IN MEXICO *(408)*

Carved figures of human beings, accompanied by hieroglyphs, or writing, have been found on stone slabs unearthed near the Monte Alban treasure tomb in Mexico. Excavators, led by Alfonso Casco, believe that the slabs indicate the presence of a mysterious race which once occupied Monte Alban. Heretofore, only two races, Mixtecs and Zapotec, were known to have lived in that city. The slabs, which had been used as building material, apparently came from some older structure than that found by the excavators. Further work will be undertaken in the hope that more light will be thrown on the unknown race, proving that possibly these earliest inhabitants of Monte Alban were related either to the Mayas or to the races of the central Mexican highlands.

CARS DRIVE INTO FIFTH FLOOR DIRECTLY FROM STREET *(B-28)*

By means of a half-moon-shaped concrete runway, trucks and automobiles are enabled to run directly from the street into the fifth floor of a Cincinnati factory. Concrete posts running from the first to the fifth floor support the runway, while, directly beneath the aerial track, is a driveway to the second floor. It is said this is the only building in this country where cars can drive so high.



Installation in Which Jets of Water Revive Wilted Spinach as It Comes to the Packing Shed

WASHER FOR WILTED SPINACH FRESHENS IT FOR MARKET

Slightly wilted spinach is being freshened for shipping to distant markets by a washing appliance recently patented. The spinach, usually wilted when it arrives from the fields, is placed on a wire conveyor on which are turned several jets of water. Sand and insects are washed off and the spinach recovers its crisp fullness. Then it is iced and shipped, the process keeping it in prime condition until the market is reached. Spinach given this treatment commands higher prices, since it remains cold, crisp and marketable forty-eight hours or longer. About 450 baskets of the vegetable can be washed in an hour, shortening the time required when the cleansing is done in vats.

GAS HELMETS USED IN AIRSHIP HELIUM COMPARTMENTS *(B-42)*

Gas helmets designed to protect workers in the helium compartments of airships have been successfully tested in the United States army. The helmet permits the worker to spend an almost unlimited time in the gas chamber. Designed like a deep-sea diver's equipment, the helmet fits over the head and is attached to the wearer's neck by a collar of adhesive tape. A window is curved to fit the forehead and is held in place by adjustable web straps encircling the head, and air cylinders are connected to the mask by intake and exhaust lines.

at 3 material lid Wright
D'aleo, slayton chick
also by metal clad Aerospac



Runway Directly from Street Level into Fifth Floor of a Cincinnati Factory

Designed by B. H. Eaton
816 Los Angeles Railway Co.
POPULAR MECHANICS

Los Angeles, Calif.

**PORTABLE DRINKING FOUNTAIN
SERVES WORK CREWS**

B 389



By Pushing Down the Plunger, the Workman Gets a Drink at Portable Fountain

Replacing the old bucket and tin cup, a portable drinking fountain has been designed and built for track-repair and construction crews of a western traction company. It consists of a tank holding about five gallons, with a fountain at one side. This is connected to a hand-operated force pump. The thirsty workman raises the pump plunger, then pushes it down to force water out of the fountain. A metal ring prevents the drinker from touching the fountain bowl, making it sanitary.

**FOURTH BIG PYRAMID IS FOUND
UNDER EGYPT'S SANDS**

B 390

Buried beneath the sand, the remains of a fourth large pyramid at Giza, recently were uncovered by an Egyptian archaeologist. The base measures more than 5,000 square yards and the monument appears to have been constructed about 2800 B. C., probably as the tomb of a queen of the fourth dynasty. It is expected that her sarcophagus, rivaling the splendors of the tomb of Tutankhamen, will be found beneath the ancient pile. Although there have been numerous pyramids found at Giza in addition to the three famous ones, all of them are much smaller than the new

Prof Selim Hassan
at Esiga

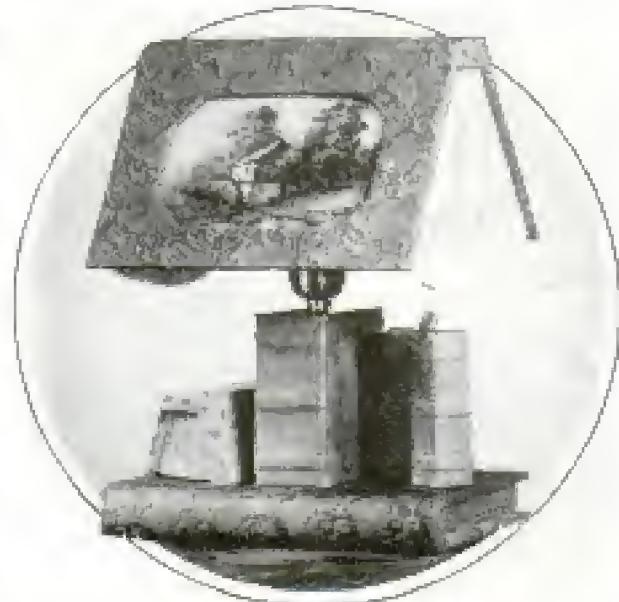
discovery. Archaeologists commenting on the find are inclined to the belief that the upper portions of the pyramid may have been demolished to furnish building material, a fate that nearly overtook some of the other large pyramids. The outer covering of the Cheops, the largest of the three famous ones, was shipped to Constantinople in an early period to build a mosque. The burial chamber in such pyramids, however, usually is underground, so that in the present case the tomb may have lain through the centuries undisturbed.

OLD BOOKS MADE INTO LAMPS

B 319

START A BUSINESS

Old books with embossed leather covers, beautiful as they are in themselves, are made doubly attractive by an Iowa craftsman who converts them into table lamps. A partly opened book forms the shade, another the pedestal and a third the base. The first of the book lamps was made from old volumes in the craftsman's own library, some old etchings, scrap lumber and a plastic compound. An exclusive gift shop bought it, ordered others, and by turning profits into further raw material, the maker was able shortly to enlarge his business. Arrangements now have been made for the book lamps to be distributed all over the country. Actual books no longer are used, but covers are genuine embossed leather.



A Lamp Made of Rare Book Bindings; Etchings Are Inserted and Lit from Within

E. Ogden The Ogden
Studio, 2917 S. Raymond
Av. Los Angeles, Cal.

Character & Service
January 2/1/32

B207 Builby Dune Lakes, II
POPULAR MECHANICS at Garibaldi Islands, Calif.

817

by Paul W. Hadden

Under-Water Mower Clears Lake of Reeds



Harvesting Neptune's Reed Patch with an Under-Water Mowing Machine; the Mower Is Operated from a Flat Boat and Removes the Growth to Give Ducks a Landing Place

Reeds and other forms of water growth that threaten to choke inland lakes in many localities, until there is little or no room left for wild life, are removed in a novel manner in one section of California. In the Dune lakes area residents have constructed an under-water mowing machine operated from a flat boat. The boat is propelled by an automobile engine by means of two paddle wheels. In its bow a single-cylinder stationary engine has been installed which drives the mower blades.

METAL STRIPS IN BRICK WALL MAKE IT WATERPROOF

03.369

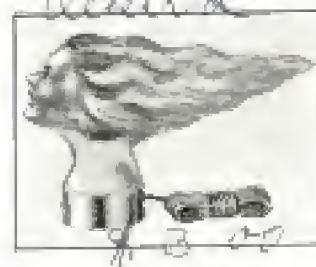
Brick walls in the modern home, while not waterproof even when chemically treated, are easily made so through the use of metal strips when the bricks are laid, a report to a recent meeting of the American Ceramic society sets forth. By the new method, a V-shaped groove is molded along the center line of the longitudinal surfaces of each brick as well as in the corresponding position at the ends. Into this groove goes an L-shaped metal strip of a non-corrosive alloy. The hook

of the L fits into the vertical groove of the brick. As the bricks are laid, the grooves of successive layers meet, so that the metal strips which overlap from one brick to another form a continuous mesh to reinforce the wall and keep out moisture. It is also said that the use of the metal strips made the task of lining the wall much easier, besides giving greater fire resistance and better insulation against heat.

CRYSTAL FIGURE FOR RADIATOR LIGHTED FROM INSIDE

288

Made from specially hardened crystal, said to be as strong as metal as well as durable and practically unbreakable, an internally lighted mascot for the radiator cap has been produced. A special gasket makes it possible to attach

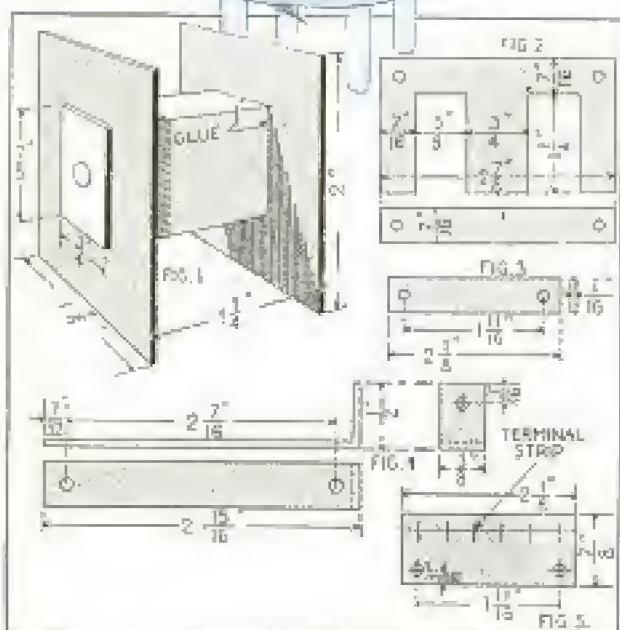


it to any radiator cap, even the ribbed ones. The figure is in the form of a woman's head with the hair streaming behind in the wind.

Campbell Products
Corp. 153 Lafayette
New York
Copyright International

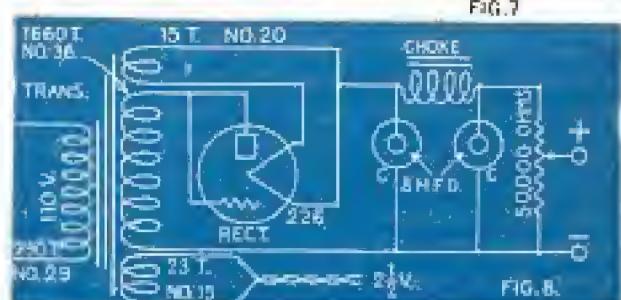
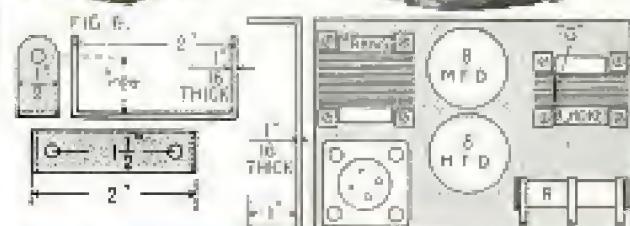
J. H. Minlon
New York

Power Unit for Experimental S-W Converters



IN order not to place too much load on the broadcast-set power supply, a separate source of power for short-wave converters is desirable. This inexpensive power pack makes the short-wave converter independent of the broadcast receiver. The transformer and choke are both homemade and quite simple, and the experience gained by building these units is well worth while. A standard choke could be used, but the same core laminations and wire as in the transformer may

also be employed for the choke. The type-226 tube for the rectifier will pass the current required for the average short-wave converter and enable the experimenter to try out a variety of hook-ups. The 1-in. sheet aluminum base is 6 by 6½ in., on top with 1 in. bent-over supporting edges as shown in the photos. The two condensers are of the electrolytic type. Fig. 1 shows the form for winding the transformer coil. A wooden block, 1½ in. long by ¾ by ¾ in., is required. This is drilled lengthwise for a ¼-in. machine screw, about 2½ in. long. The block is covered with a 1¼-in. wide strip of heavy wrapping paper for a thickness of ⅛ in. Glue is used on each layer of the paper after the first layer is wound. Cardboard ends are then cut to be applied over the ends of the block for a tight fit over the paper. Glue and gummed paper hold the ends firmly in position. Thin pieces of cigar-box wood should be used to support these ends while the coil is being wound. Large hexagon nuts, tightened on the screw from each end, will hold the assembly firmly while it is in the winding chuck. The winding details and wire sizes are given in Fig. 8.

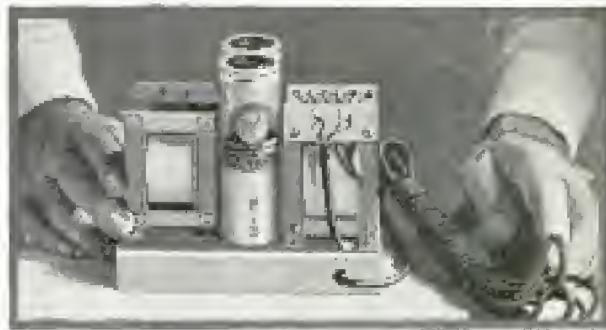


Enamelled magnet wire is used throughout, $\frac{1}{8}$ lb. of No. 36, $\frac{1}{8}$ lb. of No. 29, 10 ft. of No. 20, and 15 ft. of No. 15 being required. When winding the coil, all leads are brought out on the narrow side of the form so they will not interfere with the laminations. A flexible terminal lead is soldered to the end of the No. 29 wire and brought out through the end of the form. The wire is wound evenly back and forth across the form with a sheet of thin waxed paper between the layers. The primary coil consists of 990 turns. The wire is then cut and scraped, and another flexible lead is soldered on and brought out at the same end of the form. The primary winding is covered with three layers of strong wrapping paper.

The No. 36 wire for the rectifier secondary winding is then wound on as evenly as possible for 400 turns to each layer and covered with waxed paper. This is continued for 1,600 turns, the ends being connected to flexible leads and brought out as before. The filament secondaries are heavy and a few inches of the same wire may be left for the start and finish leads. The No. 15 wire should be put on first over a layer of friction tape. This winding is covered with two layers of tape and then the 15 turns of No. 20 wire are put on. The completed coil is covered with tape, the ends of the filament windings being led out through the tape instead of through the ends of the form. The machine screw is now removed and the center block pushed out of the completed coil. One hundred EI-3-type laminations, Fig. 2, are required; these can be bought cut to size. The metal clamping strips and mounting brackets are shown in Figs. 3, 4 and 6. The large E-type laminations are placed in the coil opening alternately from opposite sides. When the opening is filled, one of the I-pieces is put at the open end of each E-lamination. The core may be tightened in the coil with wooden wedges. Three $\frac{1}{16}$ -in. fiber terminal strips, Fig. 5, are required, two for the transformer and one for the choke, small machine screws and soldering lugs being used for terminals.

The form for the choke coil is the same as for the transformer except that the wood block is $1\frac{1}{4}$ in. long by $\frac{3}{4}$ by $\frac{5}{8}$ in., and the ends $1\frac{1}{4}$ by $1\frac{1}{8}$ in. No. 36 enam-

eled wire is used for the coil, which consists of 7,000 turns, wound on in layers and each layer insulated with tape as pre-



viously described. The choke differs only in that all of the laminations are inserted in the coil opening from the same side. Stack an equal number of straight laminations, using two of the straps detailed in Fig. 5. Machine screws clamp these together and also hold the brackets and terminal strip. The straps are placed next to the laminations in both the choke and the transformer. For the choke put a piece of drawing paper between the two parts of the core, to form the gap G indicated in Fig. 7.

The assembly of the parts on the base is clearly shown in Fig. 7, and the wiring diagram is given in Fig. 8. If a variable-voltage supply is required, the sliding contact on the divider resistor is used. The negative connection to the power unit is made either to the base or to the low-voltage end of the resistor.

Featherweight Headphones for the Deaf

Designed for extreme sensitivity, lightness and durability, these headphones will probably find their largest application in

aiding persons that are hard of hearing. They are also suitable for airplane service as they will fit readily into the pilot's helmet, and the radio amateur will

find they make long DX-listening periods less tiresome. The two weigh 3 oz.

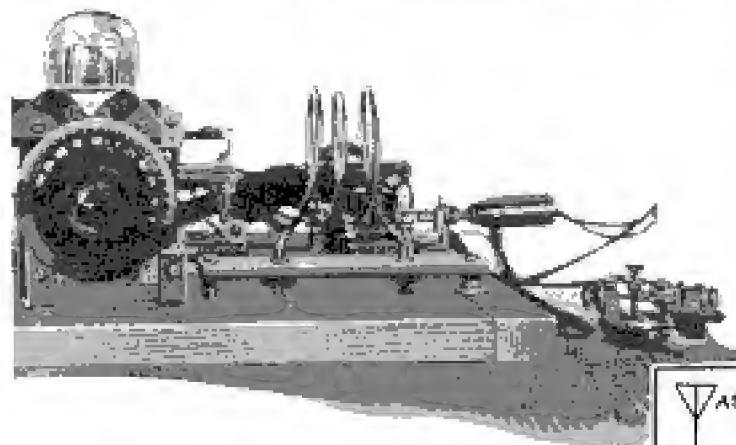
For further information on any radio construction article write to the radio department; this service is free.

*Trinity Radio Supply Co.
1528 Armitage
Chicago, Illinois*

Simple SHORT-WAVE



THIS article will describe a short-wave transmitter for the beginner who has mastered the code, obtained his license and is ready to build a low-cost experimental station. Stripped of all unnecessary controls without sacrificing efficiency, this single-tube single-control transmitter has been in use for some time at the writer's station W1BLD, Cape Cod, Mass. Good reports have been received from



great distances using a single type-210 tube. The duplicate model, shown in the photos at the head of the article, was built by W9GKU, of Chicago, who worked stations in eight U. S. districts and one in Canada immediately upon completing the transmitter. All stations reported very steady and pure d.c. signals.

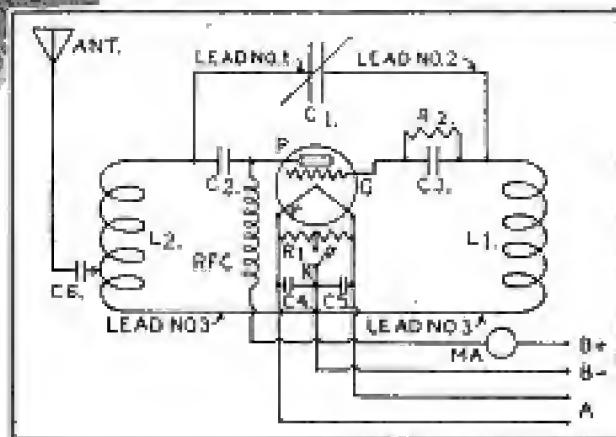
The baseboard is $\frac{1}{4}$ in. thick, 12 in. wide and 17 in. long. Referring to the letters

Has Single

and numbers on the diagrams, L₁ and L₂ are identical plug-in coils, made with $\frac{1}{8}$ -in. copper tubing. These coils are self-supporting and are $2\frac{1}{2}$ in. in diameter. For the 80-meter band, the grid coil L₁ and the plate coil L₂ will have 7 turns; for the 40-meter band 3 turns, and for the 20-meter band 2 turns. For rapid change, small plugs are soldered to the ends of the coils, as shown in the photo on page 821. The bakelite strips, into which the coil jacks are inserted, are $\frac{1}{8}$ in. thick, 1 in. wide and $5\frac{1}{2}$ in. long, and are supported $\frac{1}{2}$ in. above the baseboard.

The .0005-mfd. tuning condenser C₁ is mounted on two 1-in. metal angle brackets. The .0005-mfd. fixed mica-type condenser C₂ is connected directly to the rotor R of the tuning condenser with a small angle bracket. This condenser should be at least 500 volt test. C₃ is a .00025-mfd. fixed mica grid condenser, and C₄, C₅ and

C₆ are each .002-mfd. mica-type receiving condensers. The center-tapped resistor R₁, shown across the tube filament in the schematic diagram, has a total resistance of 100 ohms. This V-type resistor is indicated in the simplified diagram by two lines between condensers C₄ and C₅. The gridleak resistor R₂ may be any 10,000-



TRANSMITTER

Control

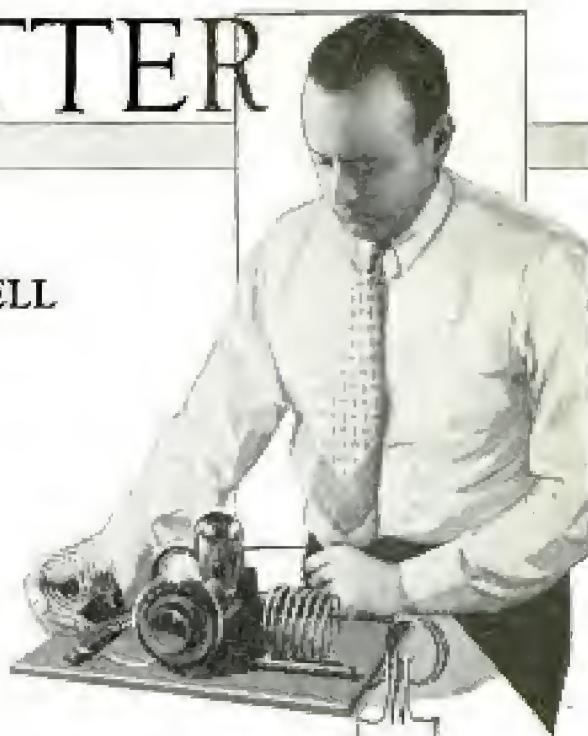
By ROBERT I. CROWELL

ohm 5-watt type. The r.f. choke consists of 150 turns of No. 30 d.s.c. wire on a $\frac{1}{4}$ -in. wooden dowel, 2 in. long.

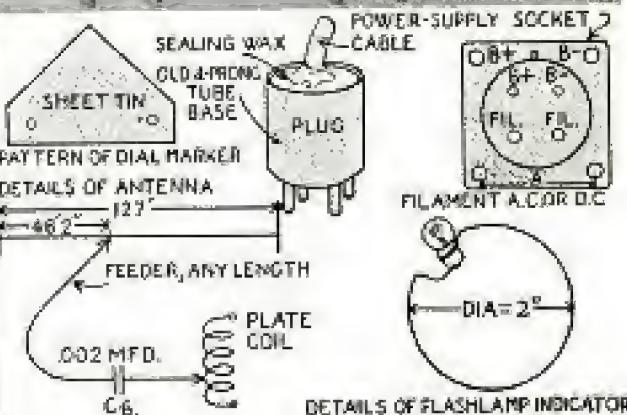
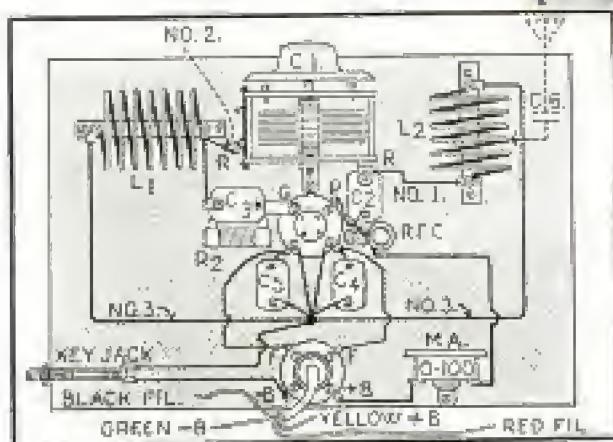
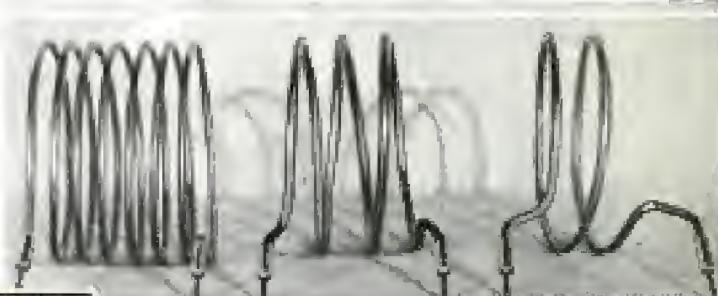
The 0 to 100 d.c. milliammeter is optional, but is strongly advised. The No. 3 leads, shown in the diagrams, need not be heavy but leads No. 1 and No. 2 should be made from the same copper tubing as that used for the coils. All other wiring may be done with No. 14 busbar wire. Enlarged diagrams and material list are available.

Although any suitable antenna may be used, the writer employs a flat top portion, 127 ft. long, and a single feeder wire of any length. The feeder wire connects to the flat top 46 ft. 2 in. from one end, as detailed in the sketch, with a fixed mica receiving condenser in series with the feeder wire. This feeder clips directly onto the plate coil at a point near the back, or filament end, of the coil. The flashlight indicator loop serves for tuning the transmitter if no plate milliammeter is used. No. 14 bare copper wire and a $2\frac{1}{2}$ -volt lamp are required.

The dial marker detailed in the sketch is formed and mounted as shown in the lower photo on page 820. A wave meter or calibrated monitor must be used to be sure that the signal is well within the



authorized limits at all times. The plate and filament supply will depend on the type of tube used. An inexpensive power unit can be built up for this purpose, or an old B-eliminator may be used. A UX-245 tube, at 300 volts, draws 50 mils; a 201-A tube, at 200 volts, 20 mils, and a UX-210 tube, at 500 volts, 80 mils. A type-210 tube with a $7\frac{1}{2}$ -volt filament transformer and plate supply from a simple power pack is advised.



Freed Telenzeon & Radio Corp.
822 22-19 West End Ave
Long Island City, N.Y.
Sight and Sound Set Employed
Sixteen Tubes



wave band. The cabinet is 17 in. deep, 57 in. high and 17 in. wide. Eight of the sixteen tubes are used in the sound receiver, seven in the television receiver, and one crater neon tube is employed. The screen upon which the picture is projected is approximately 5 by 6 in. The scanning disk is of the simple spiral-lens type, 12 in. in diameter with sixty $\frac{1}{2}$ -in. specially ground and matched lenses.

Reducing Hum in Power Units

Troublesome a.c. hum may often be reduced by merely reversing the supply-line plug in the wall socket. Many modern sets of the console type have their power units separate from the tuner, and these are carefully placed at a sufficient distance from the tuning unit to prevent hum. This is quite important, especially in a.c. short-wave receivers. Almost any type of B-eliminator will hum if not properly grounded, and an additional, or separate, ground from that used on the receiver is advised. When using B-eliminators, the necessary ground connection is usually obtained when the negative-B connection from the receiver to the eliminator is made. If the tube filaments are lighted with a storage battery and a B-eliminator is used, one side of the filament circuit

This multi-tube receiver is designed for reception of broadcast programs which are synchronized with television, and are now available on regular schedules. Optional equipment in the form of a short-wave adapter may also be used to tune in sound broadcasts not within the regular

should be grounded. To check the filament ground connect a 6-volt flashlight bulb between the negative-A post and the ground, then between the positive-A post and ground. If the bulb lights in either position, the filament circuit is already grounded and the hum does not come from this source. A steady hum is often caused by a blown or shorted filter condenser, improper wiring, poor tubes, pick-up from power lines, or improperly filtered dynamic speakers.—James Brown, New Holland, Ga.

Why Old Sets Lack Pep

Owners of old-time radio sets notice that the performance is far below what it should be, yet, for sentimental reasons, like to keep them. A new set of tubes helps, but seldom clears up the trouble. Loss of sensitivity may generally be traced directly to resistors. These resistors do not break down, but their values change until they are useless for the purpose originally intended. A new set of modern resistors will usually serve to restore the set to its original efficiency.

Shock Absorbers for Radio Tubes

Adhesive wool-felt rings are now available for gently cushioning and holding radio tubes in their respective sockets. These

may be easily installed by the set owner. A number of manufacturers are now using these felt socket washers when shipping sets from the factory complete with tubes.

The receiver will then reach the final purchaser with the same tubes which were in the set when it was tested and balanced at the factory.



Blueprints covering radio construction articles in past issues can be obtained for 25 cents each; material lists are always available without charge.

Sampson Industries
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St. Louis, Mo.

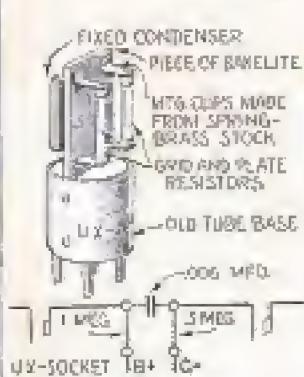
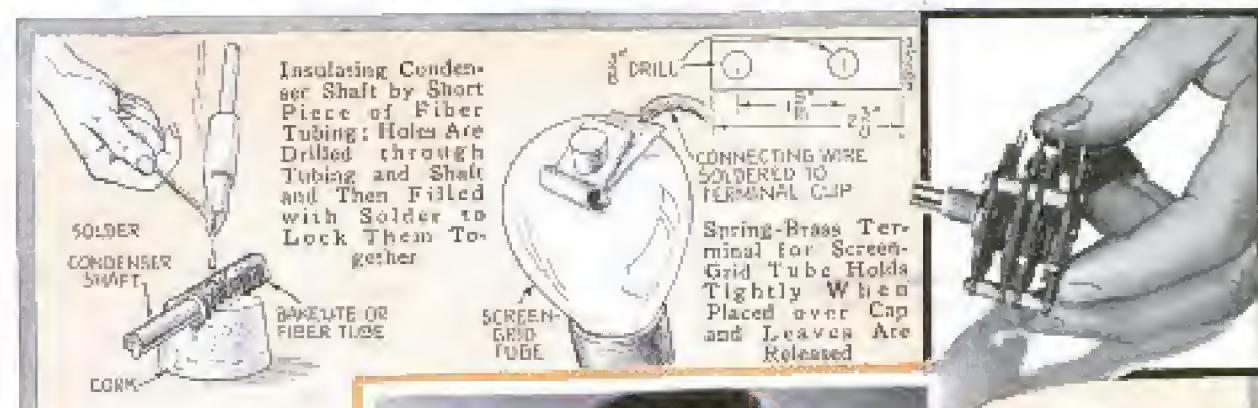
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Easy Solutions for Everyday Radio Problems



Plug-In Resistance-Coupled Amplifier Unit for Experimental Circuits When Changing to Television Reception. May Be Built Up on Discarded Tube Bases; the Resistor and Condenser Values Given in the Circuit Diagram Are Approximate



Sectional Rotary Switch Operated by Single Knob for Controlling a Number of Circuits

HOLES FOR MACHINE SCREWS

SLOT FOR BINDING POST

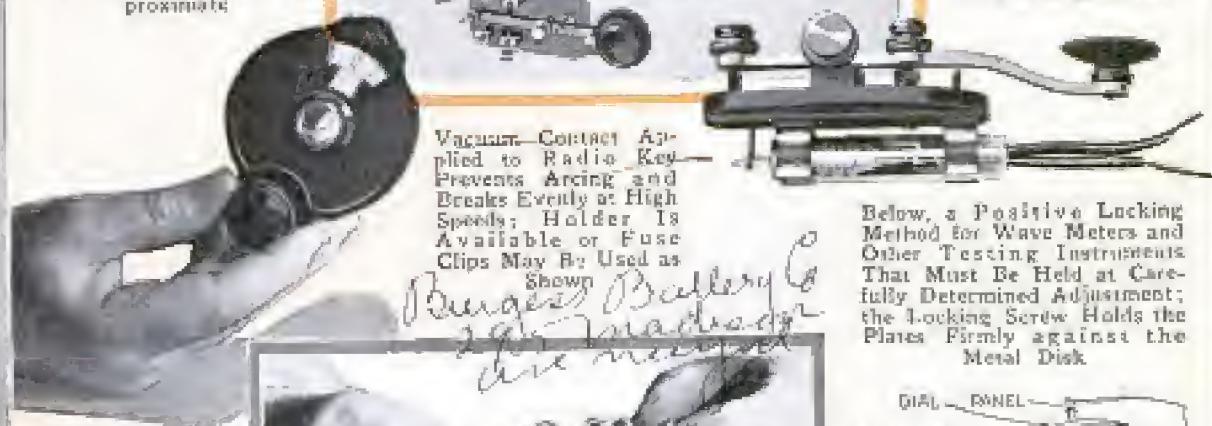
SHEET METAL

BINDING POST

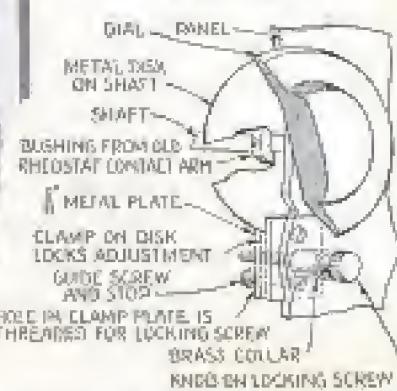
TERMINALS

CONNECTING WIRES

Slotted Metal Terminal Plate for Connecting a Number of Leads to One Binding Post; Handy for Concentrating Ground Connections



Below, a Positive Locking Method for Wave Meters and Other Testing Instruments That Must Be Held at Carefully Determined Adjustment; the Locking Screw Holds the Plates Firmly against the Metal Disk

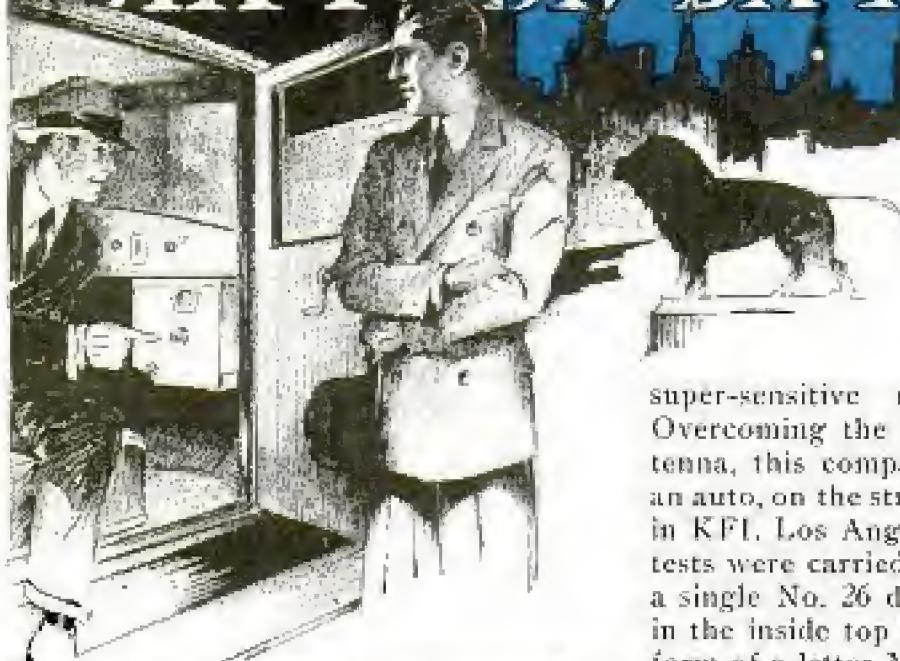


Midget Vernier Dial for Short-Wave Receivers, Portable Sets and Testing Instruments Is About Half the Size of the Ordinary Dial, and the Tuning Scale May Be Illuminated from the Rear in the Usual Manner

Low-Wave Converter Unit Designed for Receiving Police Calls on Broadcast Receivers; the Converter Is Easily Installed and May Be Quickly Disconnected for Regular Broadcast Programs

*halmar Co. Inc.
61 Sherman, Police Low Wave Laboratories
Malden Mass 1460 Harvard St. Toledo, Ohio
22.00 no Chicago*

SIX-TUBE DX AUTO



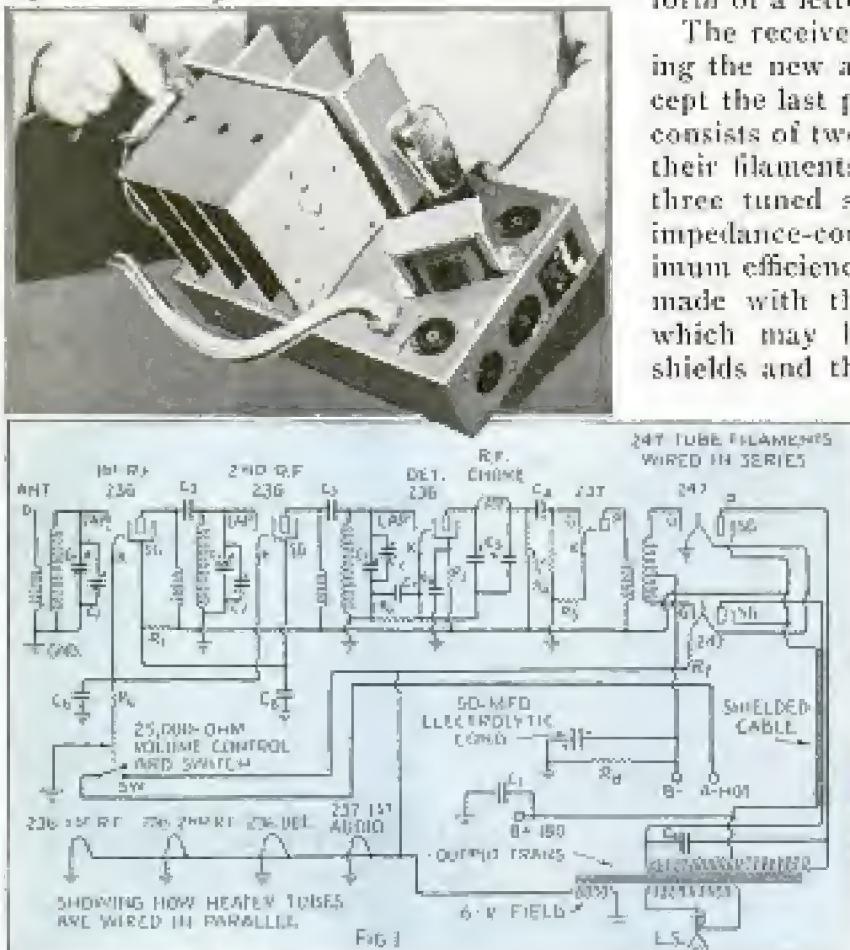
By FRANK LUND

PART I

super-sensitive radio-receiving circuits. Overcoming the handicap of a small antenna, this compact receiver, installed in an auto, on the streets of Chicago, brought in KFI, Los Angeles, at 10:30 p. m. The tests were carried out with an antenna of a single No. 26 d.s.c. magnet wire, sewed in the inside top lining of a sedan, in the form of a letter M.

The receiver is of the r.f. type employing the new auto tubes for all stages except the last push-pull audio stage, which consists of two regular pentode tubes with their filaments wired in series. There are three tuned stages, and Litz wire coils, impedance-coupled, are employed for maximum efficiency. The set is entirely home-made with the exception of these coils which may be obtained complete with shields and the 37-mmfst. condensers, C_2 , installed and ready for mounting under the chassis. The coil units may be purchased for \$1 each, and this is advised as correctly wound Litz coils are rather difficult for the experimenter who is not equipped for the job. The ganged .00035-mfd. variable condensers C_1 are of the high-shield type necessary for the prevention of oscillation.

Screen-grid power detection is used, and the r.f. tubes are also of the screen-grid type. The set is totally shielded and operates a small dynamic speaker with tone quality and volume equaling that of most home receivers.



A N auto receiver that will actually bring in stations several thousand miles away on a loud speaker, with good tone and clarity, is unusual even in this day of

RECEIVER

has

CHICAGO to LOS ANGELES range

Installation in any car is made quite simple by means of a strap-iron bracket and holder that may be noted in the photo of the test-table set-up on the opposite page. The holder enables the operator to quickly remove the set, as the speaker and battery connections are made with detachable connector plugs in the sockets at the rear of the chassis as shown. The regular car battery is used to light the filaments of the tubes and the drain on the battery is very slight. The B-supply is obtained from either B-batteries or a small auto-type dynamotor. It will be noted that 180 volts B is specified in Fig. 1, but on experimental test, it was found that 135 volts obtained from three 45-volt B-batteries gave practically the same results.

A complete list of materials is available to all upon application, and enlarged diagrams may be obtained upon the conclusion of the article in the June issue. The crado-metal chassis is 6 in. wide, $9\frac{1}{2}$ in. long and $2\frac{1}{2}$ in. high. The sheet-metal container box is $6\frac{1}{2}$ in. wide, $10\frac{1}{4}$ in. long and $7\frac{1}{2}$ in. high with lid to fit. These units are constructed from easily bent stock, or they may be purchased for a nominal amount. It will be noted that a shield cover has been placed over the top of the ganged condenser, with holes drilled for trimmer-condenser adjustments. Each of the tubes in the tuned stages is also shielded in a simple but efficient manner. The insulated antenna lead from the chassis is run through flexible woven-wire shielding.

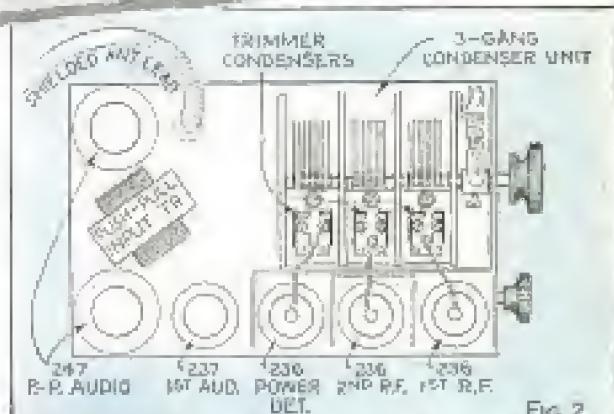
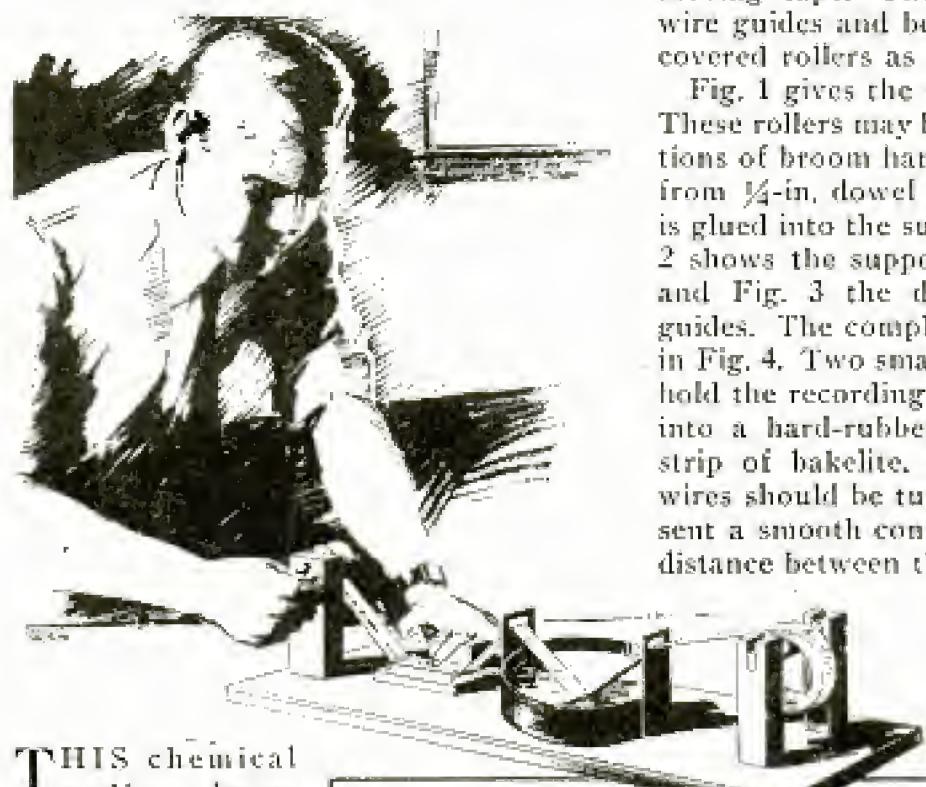


Fig. 2



Chemical Code Recorder from the Junk Box

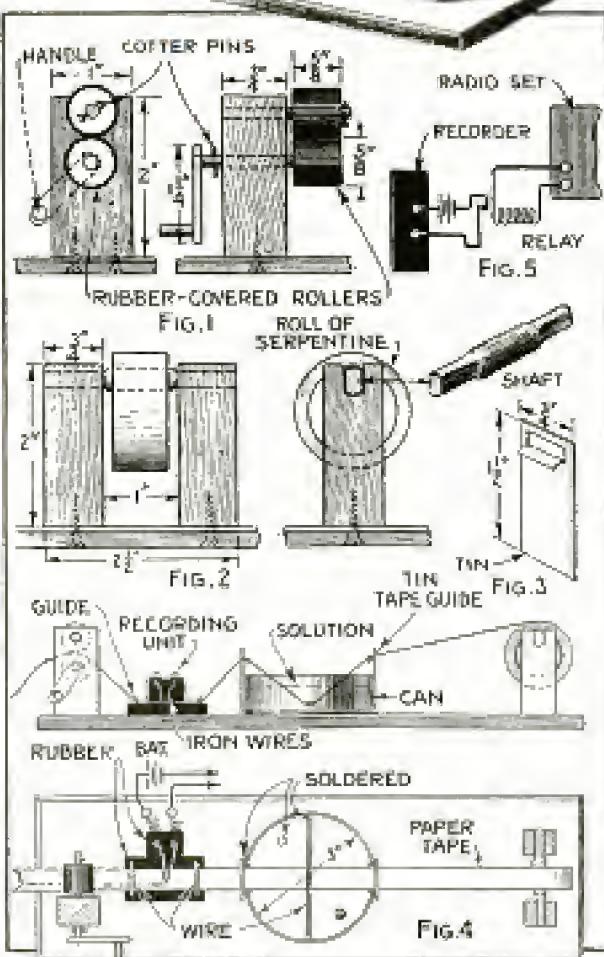


THIS chemical radio-code recorder works perfectly and costs very little. Its operation is based on the fact that a paper tape, saturated with a simple solution of potassium iodide, will register a small brown line where an electrical current is permitted to pass. The solution may be obtained at any drug store, and the tape is ordinary serpentine. This tape is pulled through the solution contained in a shallow tin pan. From the tank, it passes under the recording device which consists of a small hard-rubber block upon which two iron wires are mounted so as to touch the

moving tape. The tape is pulled under wire guides and between the two rubber-covered rollers as shown.

Fig. 1 gives the roller-mounting details. These rollers may be made from short sections of broom handle. The shafts are cut from $\frac{1}{4}$ -in. dowel stock, and the top one is glued into the supporting member. Fig. 2 shows the support for the roll of tape and Fig. 3 the details of the tin tape guides. The completed recorder is shown in Fig. 4. Two small brass machine screws hold the recording wires and are threaded into a hard-rubber block mounted on a strip of bakelite. The ends of the iron wires should be turned up sharply to present a smooth contact on the paper. The distance between the tips of the two wires should not exceed $\frac{1}{2}$ in. Copper wires are then run from the machine screws to two binding posts mounted on the baseboard.

A small sensitive relay, connected as shown in Fig. 5, completes the installation. Care should be taken in adjusting the relay with the code receiver, and some experience will be necessary to determine the speed with which to pull the tape through the recorder for best results. There is no reason why the experimenter could not use a small motor, suitably geared and controlled, instead of the winding crank if he so desires. With either method high speed code signals are easily recorded.—M. L. Wendell, Lockport, N. Y.

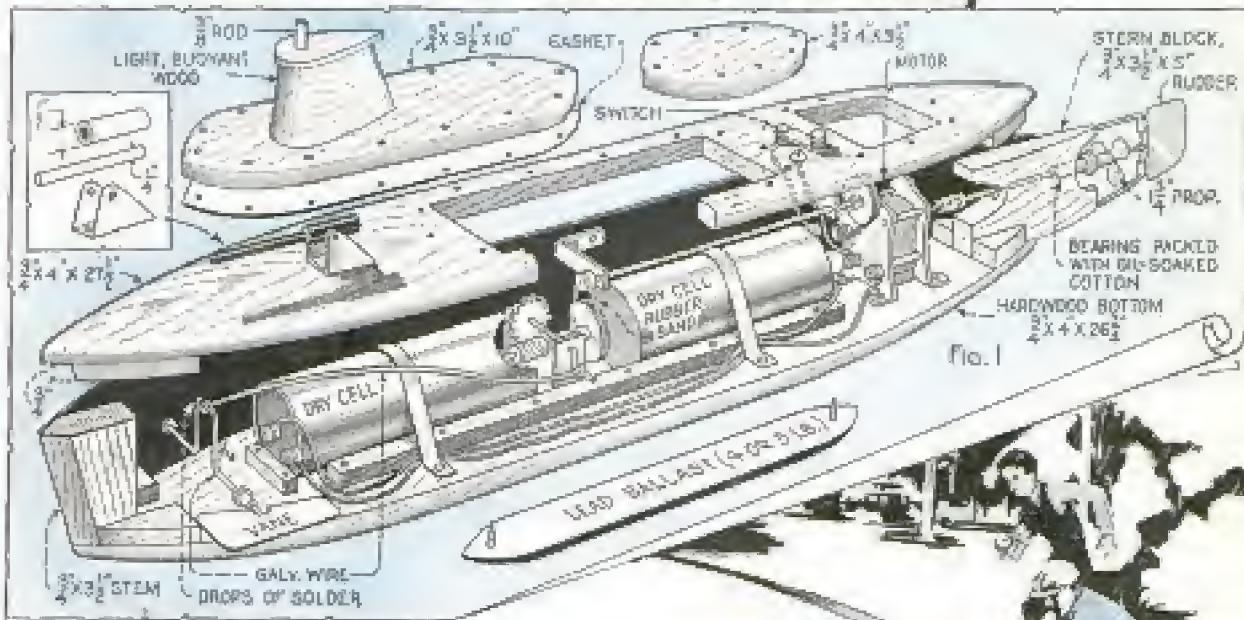


Chemical Radio-Code Recorder Showing Construction Details and Method of Recording Messages



AMATEUR MECHANICS

Electric SUBMARINE DIVES Automatically



In proportion to its size, this sturdy model submarine travels as fast under water as the full-size navy craft, and the submerging vanes near the bow cause it to dive and come to the surface automatically at 20-ft. intervals. The power plant consists of a 2 to 6-volt toy electric motor, a few pulleys, shafts, shaft hangers, a worm and wormgear taken from a toy construction set, and two dry cells.

First cut out the top and bottom pieces, as in Figs. 1, 2 and 3. A $\frac{1}{4}$ -in. hole is drilled in the stern block at the level of the armature shaft of the motor. Next, locate the motor well aft to leave plenty of space for the other equipment. The entire mechanism is laid out so that it can be completely dismantled and reassembled through the two hatches. An overhead countershaft carries power from the mo-

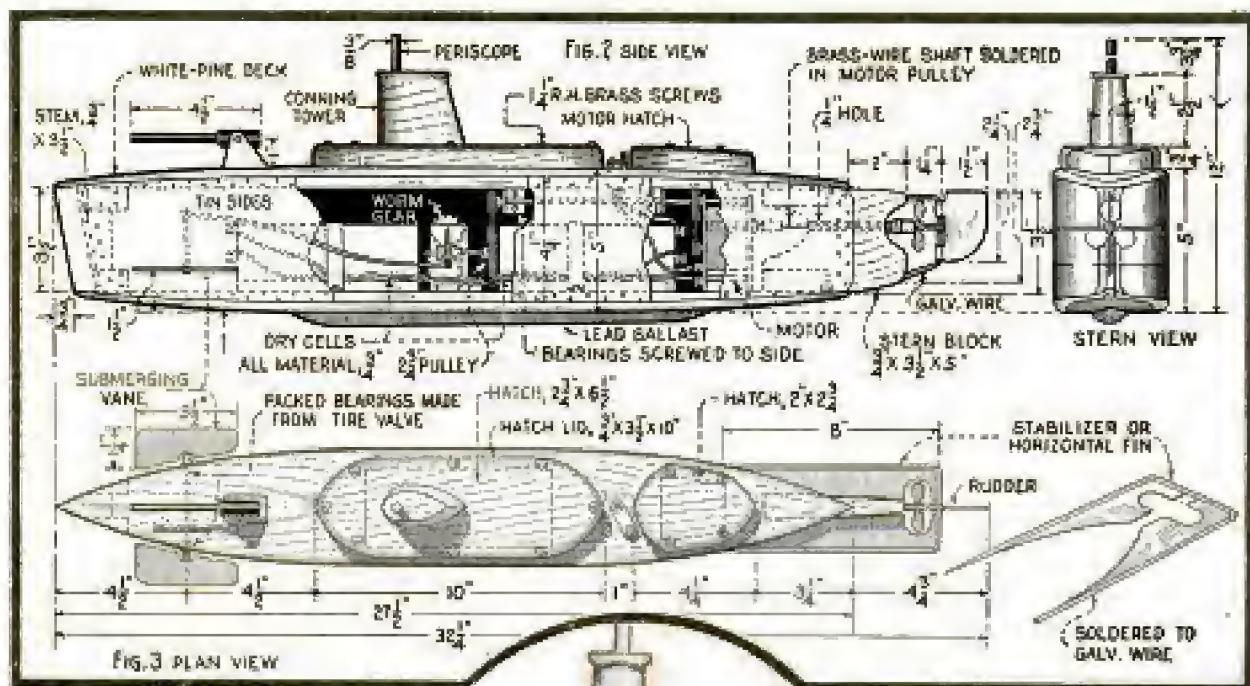


tor to the wormgear, the countershaft being supported by brackets soldered to the side, or attached in any other suitable way. Small rubber-band belts are used on the pulleys. The wormgear assembly is shown in Fig. 8.

Now make the stuffing boxes, or packed bearings, for the propeller shaft and the submerging-vane crank as in Figs. 4 and 5. Remove the valves and, with a hack-

*from Erector set
also caps from above*

*A. E. Gilbert Co.
New Haven, Conn.*

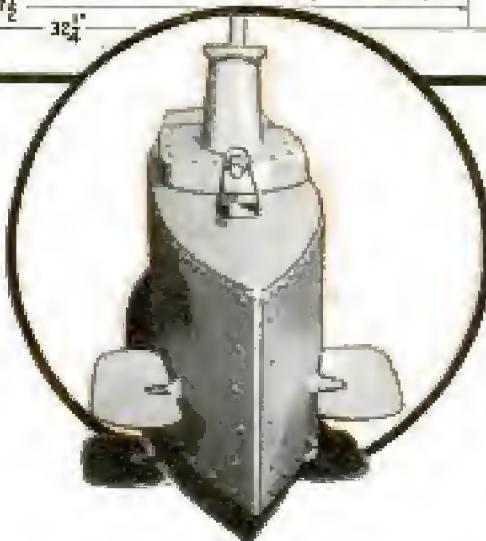


saw, cut off about $\frac{5}{8}$ in. from the end of the stem. Also remove the small nuts from the top end of the valves. In each bearing, one of these nuts is screwed on top of the cotton packing, thus forcing it snugly around the shaft so that no water can enter. At the same time it does not cause enough pressure on the shafts

to slow them. Of course, the packing must not be put in before the shaft is inserted. Cut a length of stiff brass wire for the propeller shaft. Solder one end in a small hole drilled in the center of the armature pulley. Screw this pulley to the armature shaft, with the propeller shaft extending through the hole in the stern block, and slip on the stuffing box or bearing with the large end toward the stern. While still on the shaft, but before screwing into the wood stern block, remove the nut inside the bearing, pack with cotton twine or ordinary cotton, squirt in some lubricating oil, and then screw the nut down to force the packing close to the shaft. Turn the shaft by hand to see that it runs freely, and then screw the bearing into the stern block, after having applied roofing tar or aquarium cement to the threads. A thrust washer is put on the

shaft, and a three-blade propeller, $1\frac{1}{4}$ in. in diameter, as shown in Fig. 7, will be satisfactory. This can be cut from tin, galvanized or brass sheet, and soldered to the shaft. It should fit snugly against the bearing to prevent any pressure on the propeller shaft. When soldering, the shaft can be pulled out an inch or two from the bearing. Packed bearings for the submerging vanes are made in the same manner, except that the large end is filed at an angle and soldered to the tin side of the hull. This is done before the sides are permanently fastened to the frame.

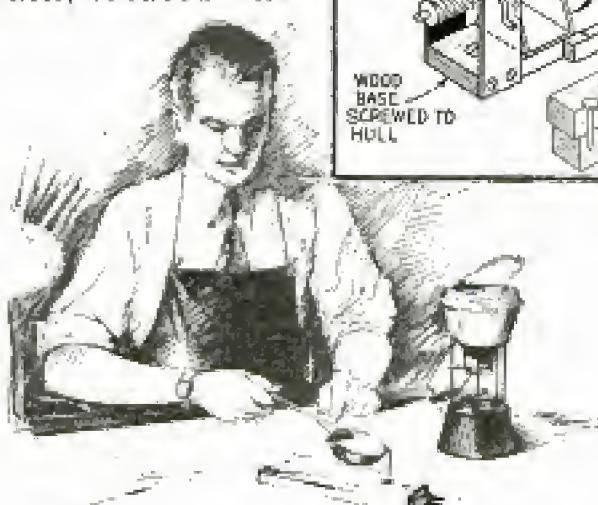
A pattern for the sides can be cut from cardboard and used as a guide in cutting the tin. Two small holes near the bow are drilled for the submerging-vane crank. Roofing cement is applied liberally to the edges of the top and bottom boards, stem and stern block, working it well into all joints. Then a strip of cotton binding tape is laid over the cement, and more cement applied on the tape, after which the side is carefully placed over the tape and nailed down with brass escutcheon nails, about $\frac{3}{8}$ in. long, or screwed on. After one side has been put on, insert the submerging-vane crank in the bearing on that side,



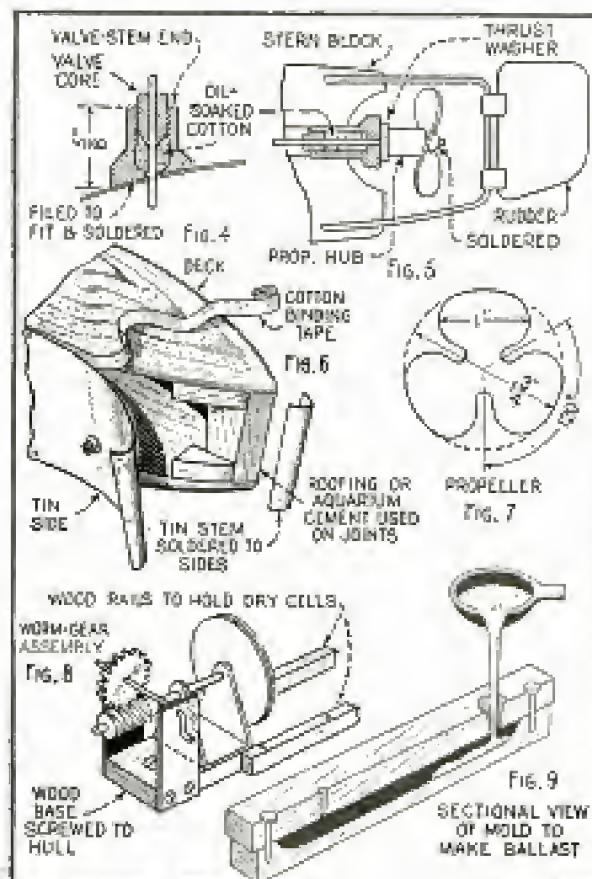
and also in the other side before nailing the latter in place. Naturally, the cement will squeeze out from under the tin while it is nailed down, and should be wiped away with a cloth.

Solder a V-shaped strip of tin neatly over the stem as in Fig. 6. It is also a good idea to pour a cupful of melted paraffin inside of the hull to run along the seams, turning the boat around and on its ends so that the wax reaches every crack, without getting it on the machinery. When working it around the stern block, keep the motor running so that the paraffin will not bind the propeller shaft upon cooling. The stabilizer at the rear consists of tin soldered to a V-shaped wire frame, which in turn, is soldered to the sides after the rudder frame, Fig. 5, has been installed. The submerging vanes are soldered to the ends of the crank as indicated.

Cardboard gaskets, treated with



roofing or aquarium cement, are fitted under each hatch cover, and the hatches then screwed down tightly. When completed, the entire job is given a coat of paint such as slate-gray, and tests are made in the water. Temporary ballast can



be screwed on to determine the proper weight so that the deck will be nearly awash. Then mold a lead ballast as in Fig. 9. Make the weight slightly heavier than needed, so that it can be trimmed down to suit. After preliminary tests, remove one of the hatch covers and inspect for leakage. In case water has entered, open both hatches and let the inside dry out thoroughly. Then screw up the nuts in packed bearings, give the outside another coat of paint, working it well into all cracks, and when this coat is dry, put the hatch covers on again.

Molding to Keep Glass in Windows

When fitting glass into windows, I was asked to put putty in so that it would last indefinitely. As an alternate solution, I substituted $\frac{1}{4}$ -in. quarter-round molding for the putty. I first covered the sash next to the glass, and the molding with white lead thinned to the consistency of vaseline. This made the sash and molding waterproof, besides thoroughly sealing the joint.—Joseph Minarovich, Berwyn, Ill.



Young Plants to Be Set Out. Kept Fresh Several Hours by Putting Soil-Covered Roots in Eggshells

Eggshell Forms a Good Container for Young Plants

When setting out young plants, half of an eggshell makes a good container for keeping them from withering. A little soil is left on the roots of the plants, and when placed in the eggshell, keeps them in good condition for several hours.

Feeding Bees on Skimmed Milk

During the early spring when large quantities of pollen is not available for the young larvae, skimmed milk can be used as a substitute. Experiments conducted in various parts of Canada show considerable increase in the number of bees and also greater quantity of honey obtained from colonies fed on a syrup consisting of skimmed milk, 2 cupfuls, and granulated sugar, 1 cupful. Ordinary 4 or 5-lb. jam tins serve the purpose of feeders, small holes being made in the covers with a shingle nail, and the

sirup then poured into the cans, which are inverted over the frames or combs in the hive. If the cans are held a short distance above the combs by means of two wooden strips, a greater number of bees can work at carrying the sirup down into the hive. It is advisable to prepare just enough sirup for the bees to consume in 24 hours, and mix a fresh batch each day.

Pruning Young Apple Trees

There are a few considerations in pruning young apple trees that are necessary, as there is a certain balance between the root and the top growth at the time the leaves drop in the fall, according to the agricultural extension service of the University of Nebraska. Destroying this balance by removing too much of the top growth causes the tree to replace the parts removed by sending out water sprouts or "suckers." The growth of young trees is greatly stimulated by pruning, and this has the disadvantage of delaying fruit production. Consequently, trees just coming into production should be pruned lightly. Growing branches and water sprouts should be cut off. After the tree begins to bear fruit satisfactorily, some of the inside and lower branches may be gradually eliminated. The average bearing apple tree should have a terminal growth of from 8 to 12 in. annually, and if less, pruning should be used to stimulate it.

In doing this, the younger parts are left to produce fruit. A light annual pruning throughout the tree is preferable to the removal of one or two large limbs.

\$1,000 in Cash For Best Models of Whittling

1st prize.....	\$250
2nd prize.....	\$100
3rd prize.....	\$75
4th prize.....	\$50
5th prize.....	\$25

BESIDES this, there will be twenty-five \$10, fifty \$5 prizes, and one thousand high-grade jackknives.

Rules for "Knife-Craft" Contest

Anyone except employees of Popular Mechanics and members of their families can enter this contest, which closes July 1st, 1932. Awards will be made by a competent board of judges and in the event of a tie for any prize offered, a prize identical in all respects with that tied for will be awarded to each tying contestant.

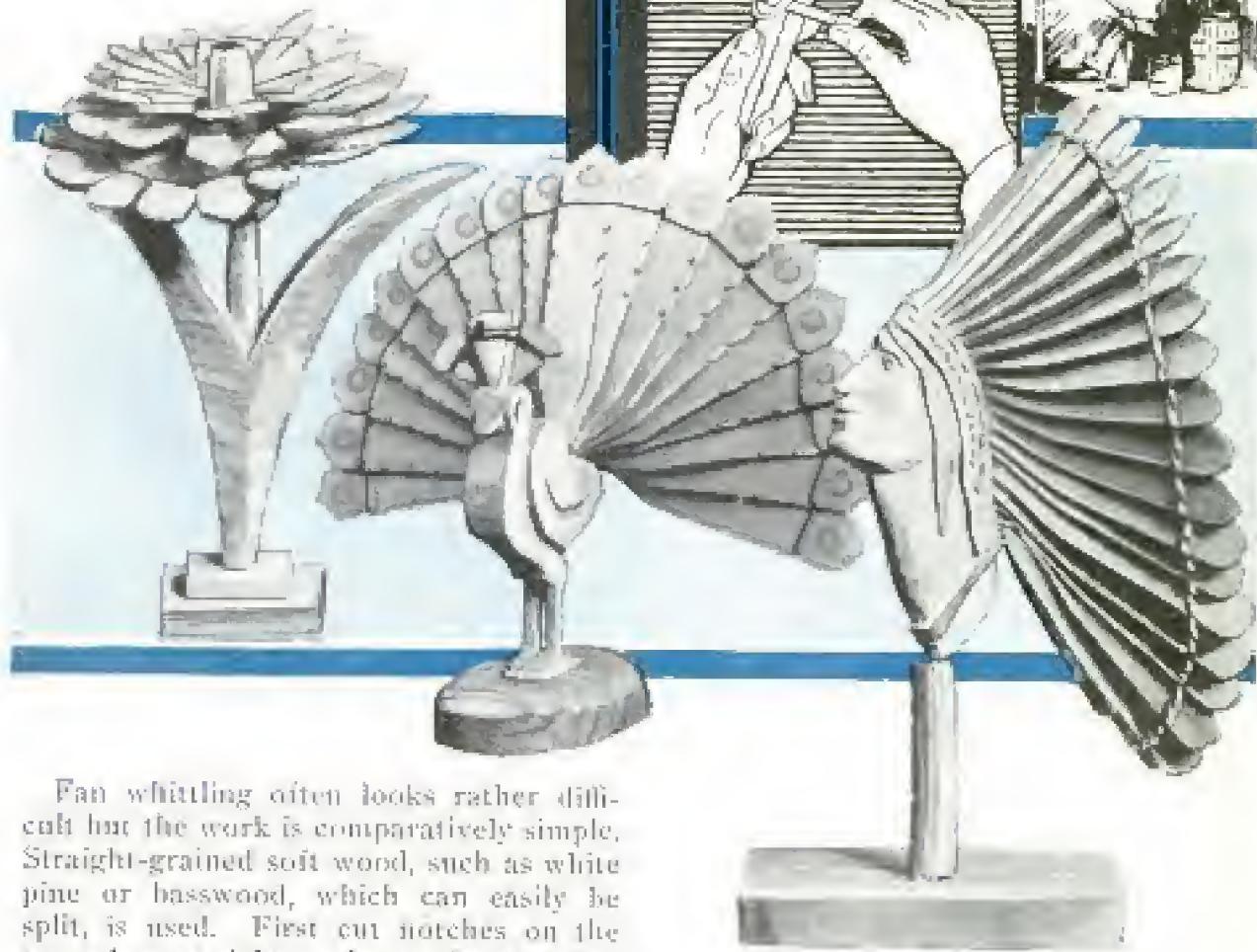
1. One or more entries may be made. Models must be entirely of wood, and cut with no other tools than a jackknife.
2. No adhesives may be used.
3. Carvings submitted must not be painted, silvered or gilded, and will remain the property of Popular Mechanics after the contest closes.

All models must be shipped, prepaid, in suitable packages to avoid breakage. Be sure to affix tag giving your name and address on the outside wrapper of the package.

Address "Knife-Craft" Editor
POPULAR MECHANICS MAGAZINE
200 E. Ontario St. Chicago, Ill.

Fan Work Adds Realistic Touch to Carving

By E. J. TANGERMAN



Fan whittling often looks rather difficult but the work is comparatively simple. Straight-grained soft wood, such as white pine or basswood, which can easily be split, is used. First cut notches on the two edges at right angles to the direction in which the wood is to be split. Notches cut about three-quarters of an inch above the handle will enable the plates to be interlocked after splitting them apart. Perforated plates of intricate designs can be made by drilling holes through the block before splitting it into $\frac{1}{16}$ -in. thicknesses or less. If the wood is dry and brittle, it should be soaked thoroughly before the plates are cut, or they will be apt to break off. Hold the plates together with one hand and slowly give the handle end a

quarter twist, after which the plates are spread apart, beginning with the center one and interlocking them as you go. "Stringing" the plates is sometimes used as an alternative of locking them, the cord being knotted between the plates to obtain uniform spacing. Fan whittling may have any number of ingenious applications, three examples of which are shown above. Bird feathers and tails, Indian headdress and flower petals are among the things that make realistic carvings.

Electric Lamp Dries Wet Shoes

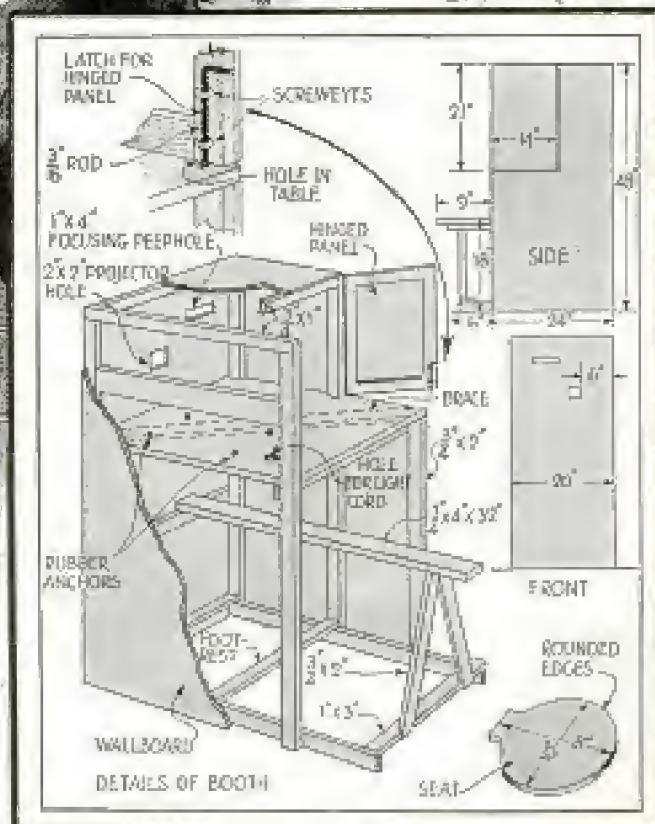
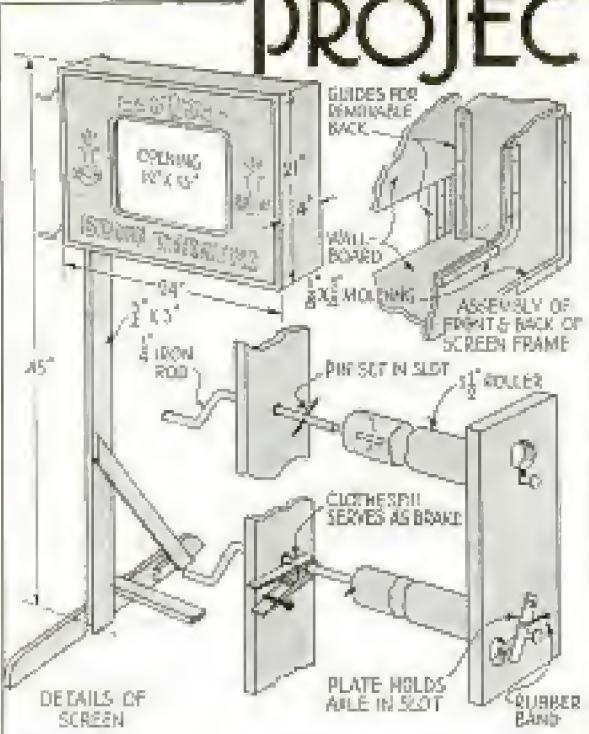
Wet shoes can be dried by placing a 15-watt electric lamp inside of them as shown. If the lighted



lamp is put into the shoe at short intervals for an hour or two, there will be no danger of scorching the lining or leather.

Discoloration of shellac varnish, in tin containers, is prevented by dissolving $\frac{1}{4}$ oz. pulverized borax in 2 fluid oz. glycerine and adding it to each gallon of varnish.

PROJECTION BOOTH and SCREEN for Home Movies



Projection Booth and Screen for Home Movies

Home-movie enthusiasts will find this projection booth and screen highly convenient for the best presentation of their programs. Light wallboard, about $\frac{3}{16}$ in. thick, is used for covering the booth, the framing of which consists of $\frac{3}{4}$ -in. stock, as shown in the lower drawing on the opposite page. As the wallboard comes in 48-in. widths and the booth is 48 in. high, there will be very little waste. Install the front panel last, after the projector has been located on the table so that the projector opening can be accurately determined. The machine should rest on rubber washers, such as are used for faucets, and should be screwed down to the table. A hinged panel to the right of the operator gives easy access to the machine when changing reels or making adjustments. The completed booth is so light that it can be carried by one person and its dimensions enable it to be passed through any door. The screen consists of a 16-in. width of window-shade fabric, part of which is coated with aluminum bronze and held on two rollers, mounted in a box, which in turn is supported at the proper height on a wooden framework. The roller arrangement is suggested in order that the roll may be used for titles and announcements as well as for the screen, but where such an arrangement is not needed or desired, the screen can be simply tacked to two crosspieces.

Cardboard Boxes Protect Shrubs from Frost

Young plants, or other lawn shrubbery, can be protected from light frost by setting ordinary cardboard shipping boxes over them. The box is turned upside down over the plant with the cover flaps extending outward as shown, so that they can be weighted with bricks or stones to prevent the boxes from being blown away.



Folding Extension Rest Holds Ladder Away from Side of House When Working on Eaves

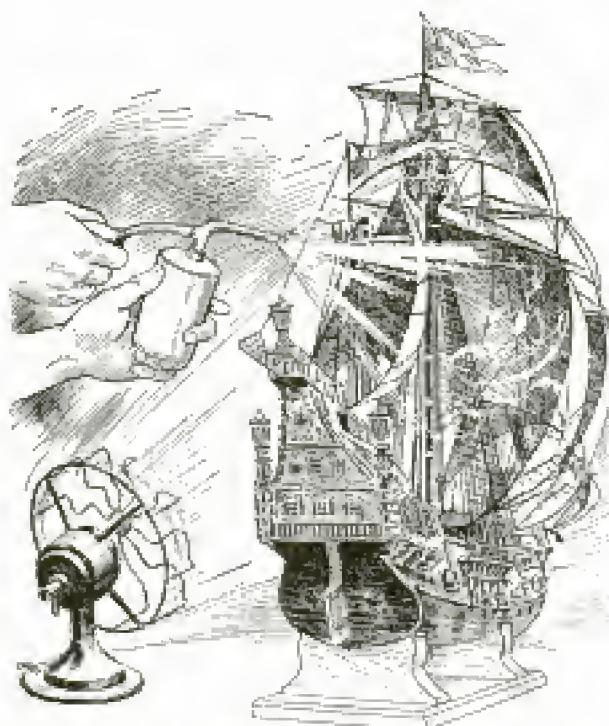
Extension Rest Improves Ladder for Work on Eaves

When working on eave troughs, an extension rest fastened to the top of the side rails of a ladder to hold it away from the wall, allows the worker greater freedom. The rest is made of four 1 by 4-in. pieces pivoted together to form pairs. One end of each pair is likewise pivoted to the top end of the ladder uprights, while the other end is slotted to fit over the top rung. A pin keeps the latter end from slipping off when moving the ladder from place to place.

Coffee Dip Gives Beads Appearance of Real Pearls

An ordinary 25-cent string of imitation pearl beads can be given the appearance of the real article by alternately dipping the beads in a strong, black coffee and drying them until they have taken the shade desired.—Geo. Gautier, Columbus, Ohio.

When tying up limbs of a tree with wire, place a section of an auto casing around the limb to prevent the wire from cutting into it.



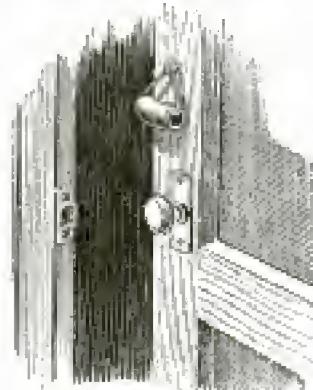
Sails Bellied While Sprayed with Solution of Water and Glue to Stiffen Them

Fan Bellies Sails While Applying Stiffening Liquid

To give the sails of a model ship a realistic "bellied" appearance, place an electric fan behind the ship as shown. While the fan is running and the sails are filled, spray a solution of water and glue, or water and cornstarch, on them with an atomizer or insect sprayer. Allow the fan to run until the sails are dry, after which they will hold their shape permanently.

Anti-Slamming Snubber on Door

Suspended from a loop of cord or wire, which is tied in the position shown, a piece of garden hose keeps a screen door from slamming. When closing, the door throws the snubber out of plumb so that it catches between the door and the casing, and when the door rebounds it slips back into position so that the door shuts entirely. Of course, it is necessary to attach the snubber to the door at a point just clearing the casing when the



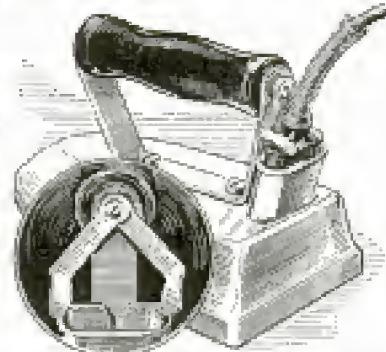
door is closed slowly, and the cord must be tied to the screw eye so that it will not slip in either direction as the hose must hang horizontally.

Nicotine Sulphate Kills Chicken Lice

Nicotine sulphate will hold chicken lice in check although it may not always exterminate them. It should be painted in $\frac{1}{2}$ -in. strips on the upper surface of the roosts about 15 to 30 minutes before the hens go to roost. The fumes arising from this application will kill body lice but is not highly effective for head lice. Chicken mites can be controlled by cleaning the hen house thoroughly and spraying the entire inside, including the nests and floors, with a solution consisting of 1 part of heavy coal-tar creosote oil and 3 or 4 parts of kerosene. Scaly-leg mites can be eliminated by dipping the feet and legs of the fowl in crude oil or kerosene, at intervals of 10 days, until the scales have disappeared.

Clamps Hold Electric-Iron Plug Tightly in Socket

The tendency of the attachment plug to work out of the socket on an electric iron can be overcome by using a pair of clamps made from a piece of sheet metal or annealed clock or photograph spring. The clamps are shaped as shown in the detail, and fastened underneath the screw that holds one end of the handle. In use, the plug is inserted in the socket and the clamps squeezed together to snap over the edges of the plug.



Coppering Solution for Oily Steel

To make a coppering solution that will adhere to oily steel, dissolve sulphate of copper, $\frac{1}{2}$ oz., in water, 4 oz. To this solution add, a drop at a time, sulphuric acid, 1 teaspoonful, after which the mixture is applied to the steel with a small swab.

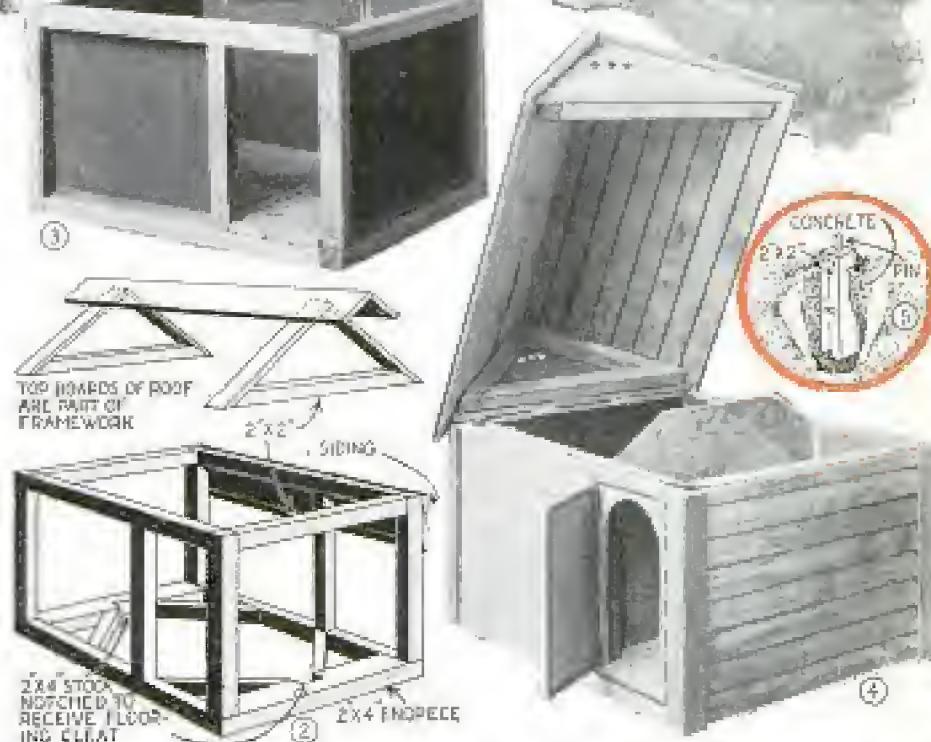
Attractive Homes for your Pets

by Robert Gregg

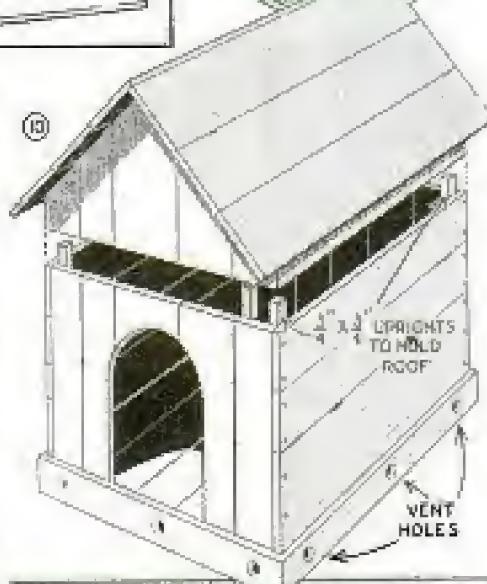
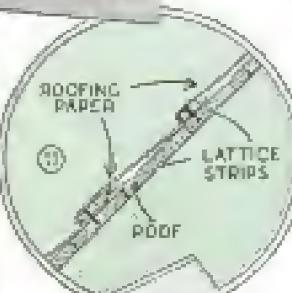
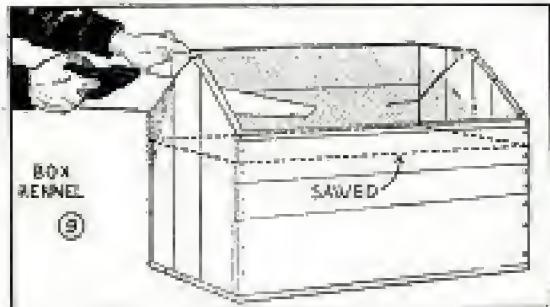


SANITARY dog shelters, that are convenient to both occupant and owner and improve the appearance of the back yard, cost practically no more to build than the common type. Starting out, consider the good features of the kennel in Figs. 1, 2, 3 and 4. Notice the hinged roof and removable flooring that allow ready cleaning, and the inner and outer draft-proof doorways.

Take some lengths of 2 by 2 and 2 by 4-in. stock to construct the framework shown in Fig. 2, using simple butted joints all around. For the average dog, the dimensions would be about 35 in. long by 30 in. wide by 32½ in. high, the sides being 22½ in. in height. An inner lining is nailed directly to the inside of the end framing and to cleats along the side, as can be seen in Fig. 3. The flooring is matched tongue-and-groove stock, held together by a cross timber recessed into the bottom framework. A small square of the flooring on both long sides is cut away to admit wooden slides, which hold the hallway partition. The roof is even more simple, consisting of two triangular frames held together by lengths of siding which



overlap the frame proper about 2 in. all around. Standard siding is also used to cover the lower part of the frame, with the end grain at the corners effectively hidden by butted strips of 2 by ½-in. stock. Fig. 4 shows the finished kennel, ready for white and green paint and a roof of asphalt shingles. The roof is hinged at the far end. Ventilation holes are drilled through the gables. The outer door consists of two slabs of plywood, one cut out to make a 9 by 16-in. opening, while the other, left plain, is hinged to the siding. When finished, the house is mounted on four stakes, set in concrete as shown in Fig. 5. These stakes are fitted with metal pins to fit corresponding holes



drilled in the bottom of the frame. You can make the shelter as novel as you like by adding small windows and dormers, as suggested in Fig. 6.

To combine novelty, simplicity and economy, why not make the barrel kennel shown in Figs. 7 and 8. Fifty cents and your time make it. Besides the barrel, it consists of two supports, a piece of plywood to fit the end, and another piece to form a floor which is nailed to three small cleats. The small runway shown adds to the appearance but is not nec-

essary. Another example of a cheap, but fairly practical, kennel is the packing-box shelter shown in Figs. 9 to 13, inclusively. It is just the thing for the summer cottage, the basement or the garage, where elaborate construction and draft-proof joints are unnecessary. Needless to say, the galvanized ridge-roll method of ventilation is interchangeable with the gable holes already mentioned. Suitable strips should be fitted at the corners to cover the end grain. To determine the right size of the kennel, measure your dog some time when he is lying flat on his side at complete ease, his legs stretched out straight

as if walking. Say the space is 20 by 28 in. Then stand him up and see how tall he is at the shoulders. May be 15 in. Allowing 2 in. additional each way on the floor space, you get the kennel 22 in. wide and 30 in. long. A 9 by 15-in. doorway is suitable. Two fittings will be necessary:

a bed of fine straw sewn up in denim or duck ticking to form a 2-in. mat the same size as the kennel, and a resting bench about 24 by 32 in., made from two lengths of 2 by 4-in. stock with 32-in. slats nailed across them, leaving a $\frac{1}{2}$ -in. space between the strips. The resting bench is not for the kennel proper, but is to be used outside, when the ground is too damp and cold for the dog to lie directly on it. Fit the bench with a 2-in. rail all around to hold the mattress, and you have solved the problem of housing your dog in the basement, garage or sheltered back porch.

The shingled exterior kennel, with a small dormer set in the long slanting roof, as shown in Figs. 14 to 19, inclusively, is an example of attractive simplicity.



In this case, the floor is not removable, and the frame is simply built on the plywood bottom. The average dimensions would be 40 in. from front to rear, 30 in. from side to side, and 30 in. from ground to gable peak. The whole frame is constructed from 2-in. stock with the exception of the $\frac{1}{2}$ -in. strips, forming the framing for the dormer, and the turned pillars. The shingles are clinch-fastened to suitable slabs of plywood, after which the finished slabs are nailed into position. The back of the kennel should be hinged to allow cleaning. Suitable strips, either overlapping or butting the shingles, or metal beading should be used to finish the four corners, as shown in Fig. 15. The small dormer is a dummy, made from two or three shingles to any proportional dimensions. Celluloid is used for the window in order to give a natural glass effect. The manner of fitting the dormer is apparent from Figs. 16 and 17, the sides of the unit simply fitting inside the framing. White lead or marine glue should be used to make the joints watertight.

As in the other kennels described, the doorway need not be over 9 by 15 in. in size. Direct drafts are prevented by means of the familiar duck or canvas curtain

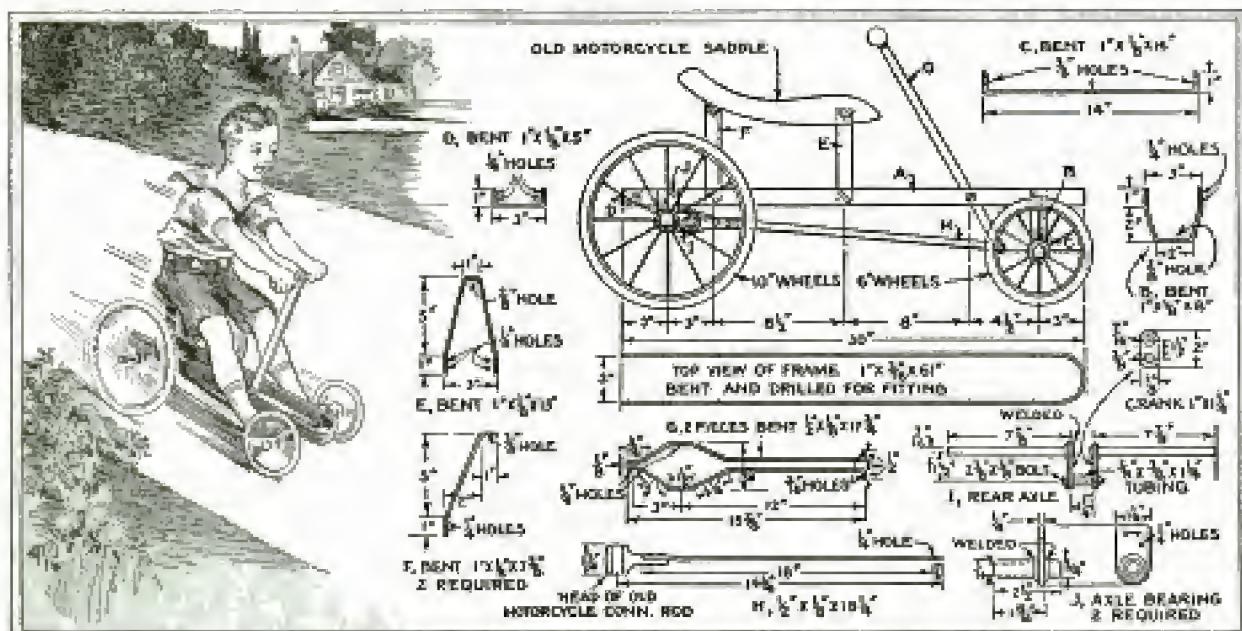
shown in Fig. 18. This should be well weighted with shot or sand so that it keeps the opening closed. Also, it must be carefully hemmed all around to prevent the edges from fraying. Ventilation is obtained with the galvanized ridge roll already mentioned.

Fig. 19 shows the finished kennel. It should be mounted so that the interior will be dry and comfortable at all times. If the drainage around the kennel is poor, try another location, or, if this is impractical, set it up higher on suitable posts or concrete blocks.

Tin Lid Scare Birds from Garden

Birds can be kept out of the garden by tying a bright tin lid on a stake driven into the ground so that it extends about 2 ft. The lid, swaying in the breeze, will be found effective in scaring away birds.—W. White, Kingston, Ont., Can.

This Sidewalk Handcart Is Made of Metal



As a sidewalk vehicle a handcart is usually more fascinating to the youngster than the tricycle. The flat-iron frame is first bent to shape, forming the side members of the chassis, which are parallel and 3 in. apart inside. Next bend the rear crosspiece of the frame D and rivet it in place. Then, using a square to assure proper alignment, lay out the rivet holes in both sides of the frame for fittings B, E, F, G and J. In bending cold-rolled steel, heating will be unnecessary if care is taken to scribe the bends on the inner side. If the metal is scored on the outside, fracture may occur at the scored place. Do not attempt to make the bends as sharp as in the drawing for this is neither necessary nor does it affect the efficiency and appearance of the cart. A piece that is being assembled to the frame is best drilled by clamping it and the frame together in a vise in proper position and using the holes previously drilled in the frame as guides. This assures proper alignment of rivet holes. The rear-axle bearing members, J, are attached to the sides of the frame, their centers spaced 3 in. from the rear end. They are held in position by bolts instead of rivets to facilitate assembling of the rear axle. To assure easy running of the axle, these pieces should be bolted to the frame while the tubing is being brazed or welded to the support member. Assemble one side

to the frame by clamping it in place and drilling. Pass the piece of $\frac{1}{2}$ -in. axle stock through both bearings to obtain alignment, and drill the other side. Construction of the rear axle, I, is begun by making the two crank members. Bolt a piece of tubing between the crank sides. Then pass the piece of axle stock through the $\frac{1}{2}$ -in. holes and braze or weld it to each of the crank sides. With a hacksaw, remove the portion between the crank throws. The rear part of the connecting rod, H, is made by cutting off the wristpin end of an old motorcycle connecting rod about 3 in. from the center of the wristpin hole. Flatten one side with a file, as indicated, and rivet it to a piece of $\frac{1}{2}$ -in. cold-rolled steel, $18\frac{1}{4}$ in. long. Drill a $\frac{1}{4}$ -in. hole at the other end. Piece C supports the front axle and serves as a footrest for steering. Attach it under B with a short $\frac{3}{8}$ -in. bolt. The latter should be assembled head down and fitted with a cotterpin to prevent the nut from coming off. The front axle is a piece of $\frac{3}{8}$ -in. round rod, drilled at each end for cotterpins to hold the front wheels. The distance between centers of pieces E and F is governed somewhat by the distance between the attaching bolts on an old motorcycle saddle. A board cut to saddle shape may be used if a saddle is unobtainable. The rear wheels are held to the axle by cotter keys fitting $\frac{1}{8}$ -in. holes

drilled through their hub shells and through the axle after the wheels have been put in place. Ordinary 6-in. buggy wheels take $\frac{1}{8}$ -in. axles and 10-in. wheels $\frac{5}{8}$ -in. axles in standard sizes.—L. D. Richards, Denver, Colo.

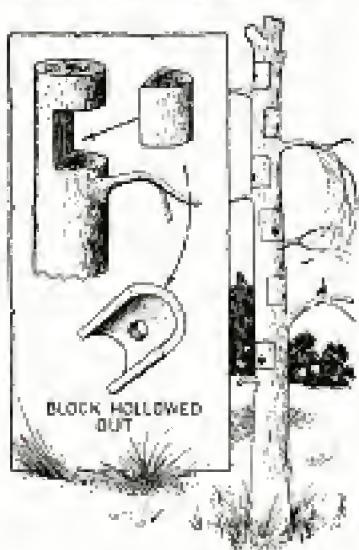
Rule Holder Facilitates Measuring

Mounted on small brackets on a wall in a convenient position, a steel rule can be used for measuring small pieces of work without taking it from its resting place. The brackets are small blocks of wood with saw slits cut in them to take the rule, and are held to the wall by screws or nails. The rule, of course, can be removed from its holder and used anywhere.—Walter E. Burton, Akron, Ohio.

Bird Houses in a Dead Tree Trunk

A number of bird houses can be made in the trunk of a dead tree about 12 in. in diameter. The branches, except a few that are left for perches, are removed. Sections of the tree are then cut out at regular intervals and hollowed, after which they are replaced and held by means of small wooden wedges. Care should be

taken not to cut the sections so deep as to weaken the tree. A door is drilled in each section. If large cracks are left when replacing the sections, they can easily be filled with putty.—Kenneth R. Dear-dorf, Bemidji, Minnesota.



Repairing a Windshield Wiper

Dried and cracked rubber of a windshield wiper can be replaced with a piece cut from an old inner tube. It will, of course, be necessary to trim the edge perfectly straight so that it projects about $\frac{1}{8}$ in. This can be done by using a straight-edge and a sharp knife.—A. H. Vance, Harshaw, Wis.



Plywood or Wallboard Doors Hinged to Closet Shelves Improve Their Appearance and Keep Out Dust

Closet Shelves Fitted with Doors

Doors hinged to closet shelves keep out dust and improve appearance. The doors are made of plywood or wallboard and are attached as indicated in the drawing. A wood strip fastened behind the door at the top provides a base for the hinge screws and keeps the door from swinging in too far when shutting it. Small latches are used to keep the doors closed.

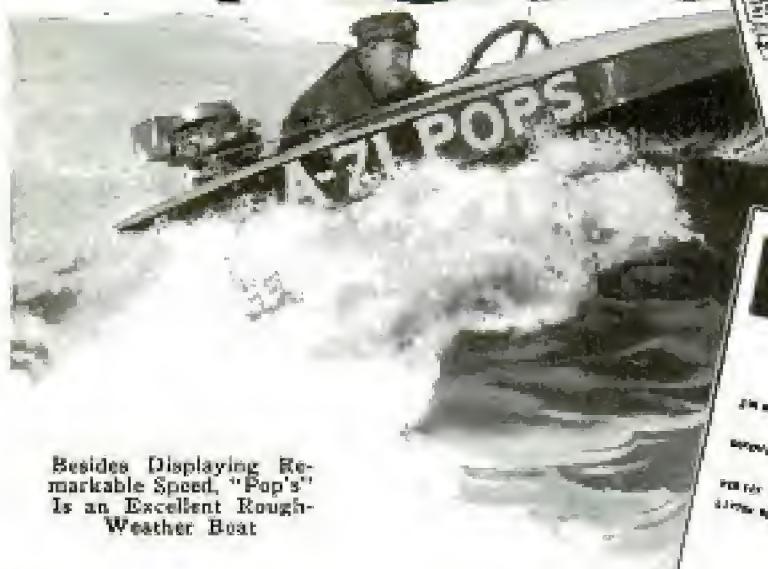
Improvised Electric-Lamp Standard

Tamped tightly with dirt, a can or a bucket and two pieces of wood, nailed together as shown, make a practical holder for an electric lamp, when working in places where an extension cord cannot be hung conveniently. This holder costs nothing to make and serves its purpose as well as a more expensive article.



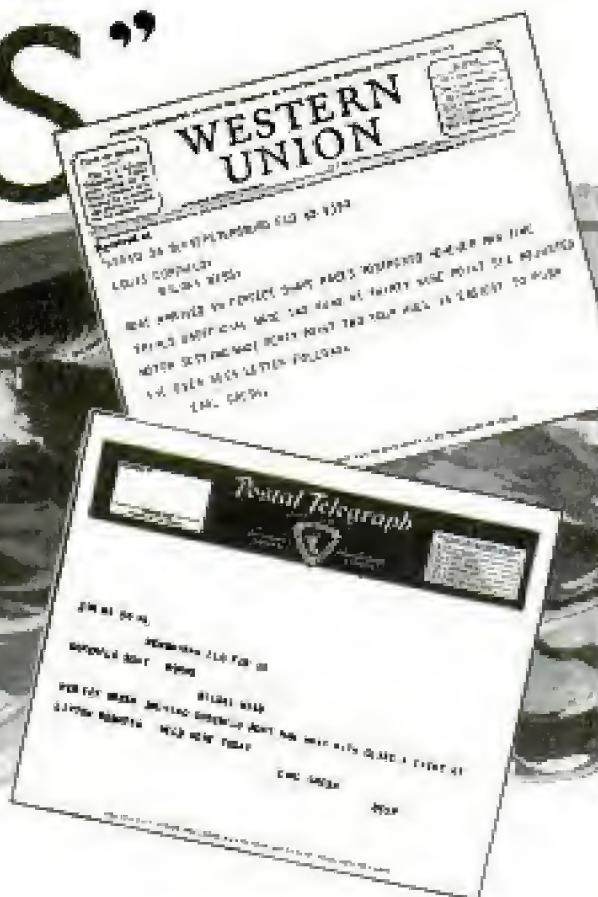
refer to Shop notes for list of materials

"POP'S"



Besides Displaying Remarkable Speed, "Pop's" Is an Excellent Rough-Weather Boat

TRULY a revelation in speed, "Pop's," a new outboard of the class-A type, has been sent over the water at 40 miles per hour. As it was designed by professional boat builders, solely for attaining high speed, the average builder should not change the parts of this boat in any way. Before cutting out the parts, draw a full-



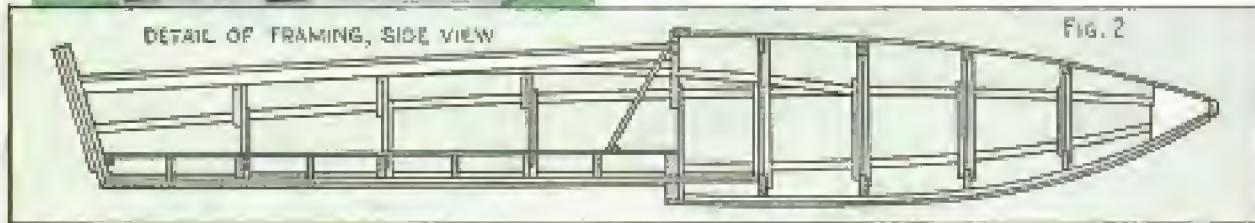
size layout on a smooth floor so that each part can be checked. Some parts, such as the chines, deckline battens and forward-plane keel should be soaked in boiling water for at least 30 minutes before bending them in place to avoid twisting the hull, which may happen if these tough pieces are attached and bent while cold. A simple steam box consists of a length of 2-in. pipe capped at the lower end and set over a flame.

The material used for "Pop's" is as follows: mahogany for the stern, deck trimmings and molding; first-grade oak for the chines and deck battens; hard poplar for the frames and deck beams, and red cedar for the planking. Hard poplar or ash can be substituted for mahogany on the sternboard. Fir plywood is used for the deck and flooring.

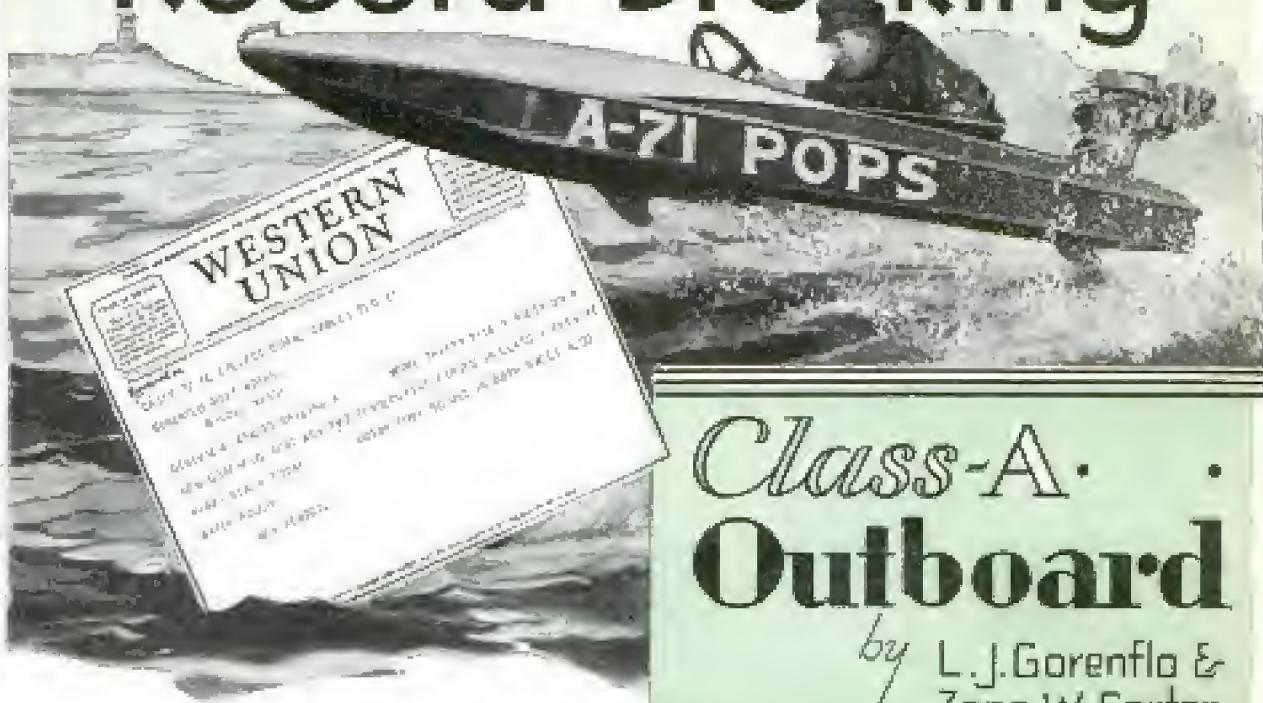
Several of the after-plane frame cross-



DETAIL OF FRAMING, SIDE VIEW



-Record-Breaking



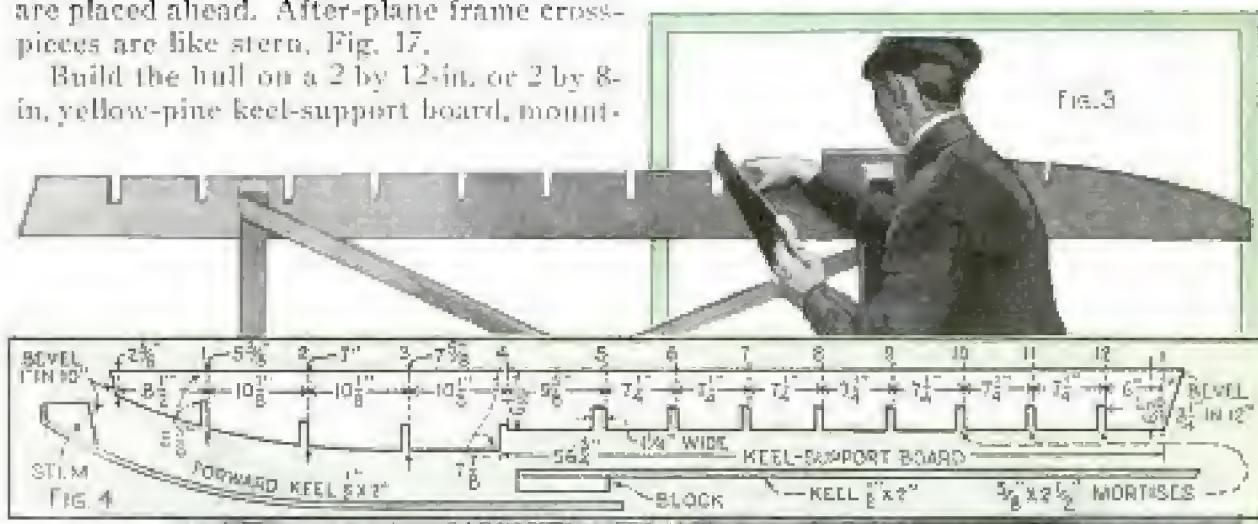
Class-A. Outboard

by L.J. Gorenflo & Zona W. Carter

pieces can be "stacked" for bandsawing, and the notches routed as in Fig. 5. In making frames, Figs. 6 and 9, casein glue is used. The uprights are glued and clamped to the crossmembers, and the parts set aside overnight to dry before driving in screws. Throughout the entire construction, flat-head brass screws are used. The uprights on the forward-plane frames are placed behind the crosspieces, while those on after-plane frame and step, are placed ahead. After-plane frame crosspieces are like stern, Fig. 17.

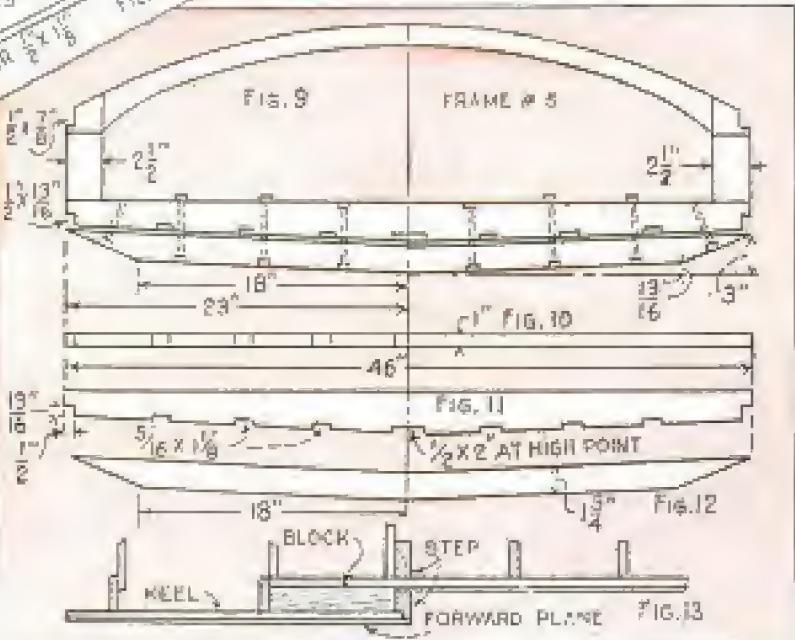
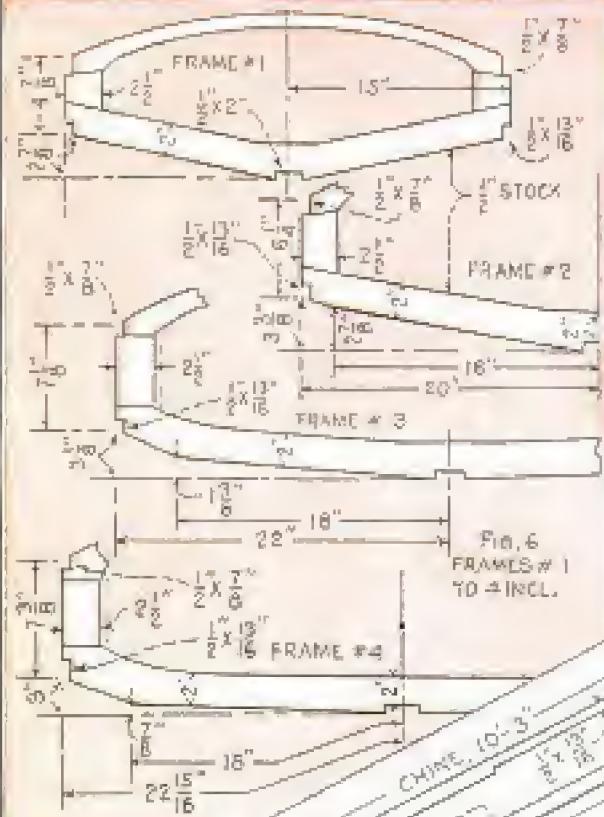
Build the hull on a 2 by 12-in. or 2 by 8-in. yellow-pine keel-support board, mount-

ed on legs so that it will be about 30 in. above the floor level, as shown in Figs. 3 and 4. The forward side of the notches in the keel-support board should be cut at a slight angle to allow perfect alignment of the frames when assembling. The stern-board is first set in position, being temporarily fastened to the keel-support board with long screws. The frames are then



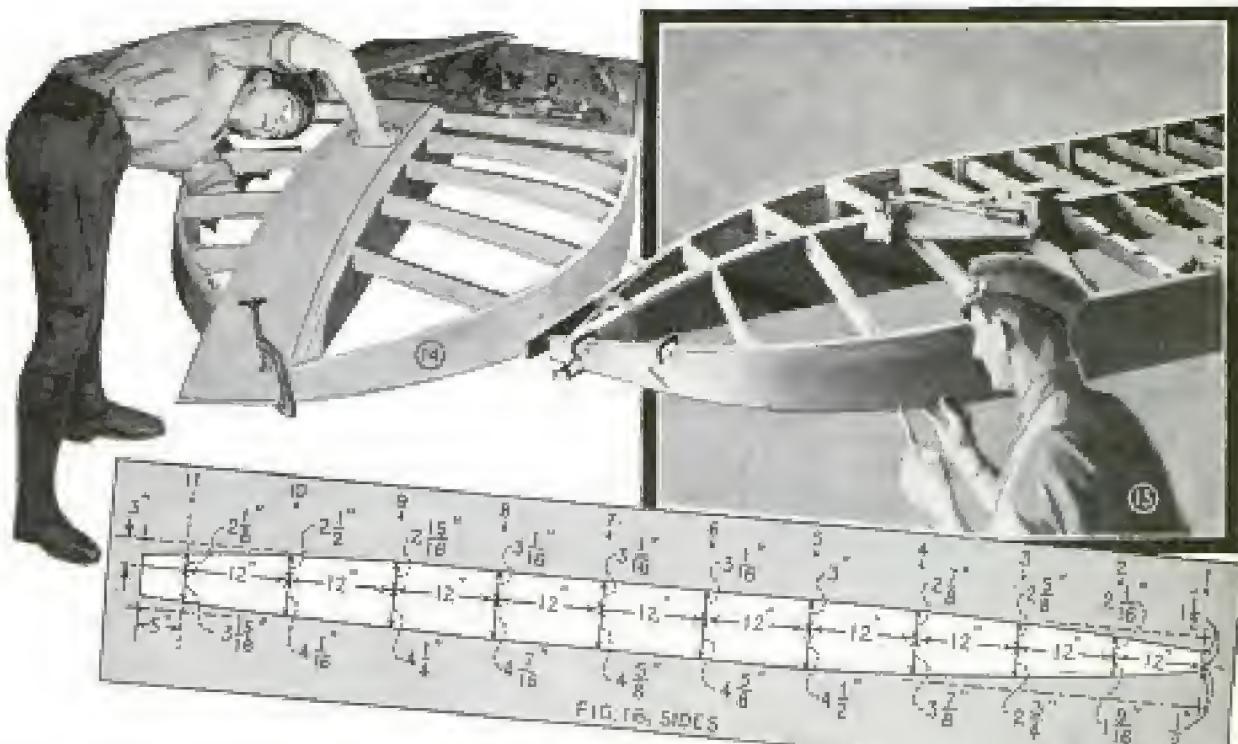
A Straight 2 by 8-In. Keel-Support Board Holds the Hull While Assembling





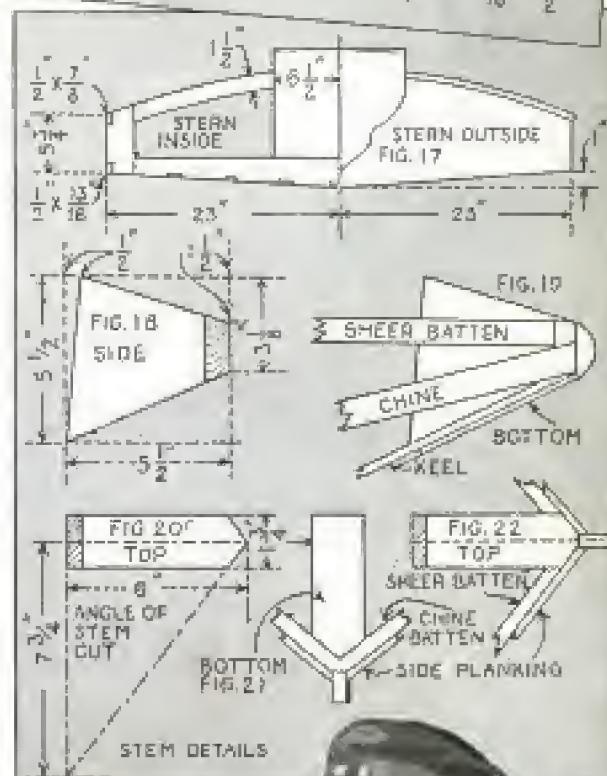
placed, and small wedges driven between each one and the keel-support board, as shown in Fig. 1, so that the bottom of the keel notch will be flush with the top side of the keel-support board. The keels are attached with No. 6 1 1/2-in. screws, two to each frame except frame No. 1, which, owing to its V-shape, or "deadrise," can only take one screw, Fig. 1. The forward-plane keel projects over and is screwed to the filler block on the after-plane keel. Wherever two pieces of wood overlap, a coat of glue should be applied between them. A nose block, Fig. 18, of redwood is cut to receive the chine and sheer battens, as in Figs. 19, 20, 21, 22. If heavier wood is used, cut out a semicircle in the after portion to lighten it. Limber holes or V-notches are cut in the frame cross-pieces alongside the keel to allow water to collect at the rear.

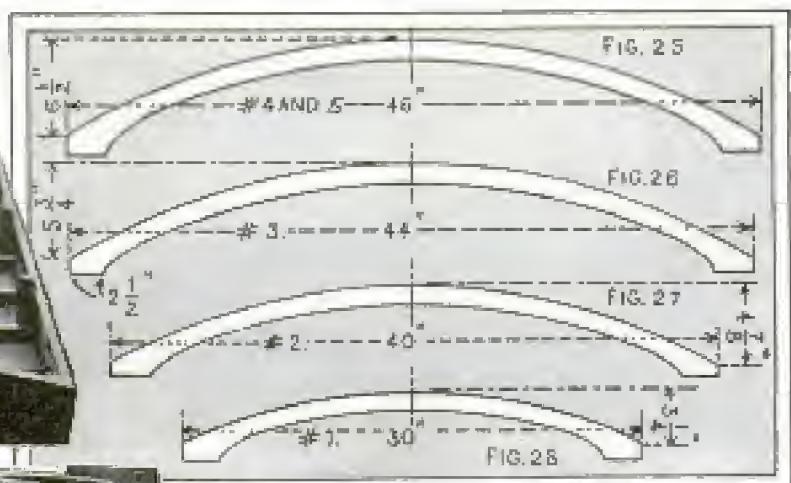
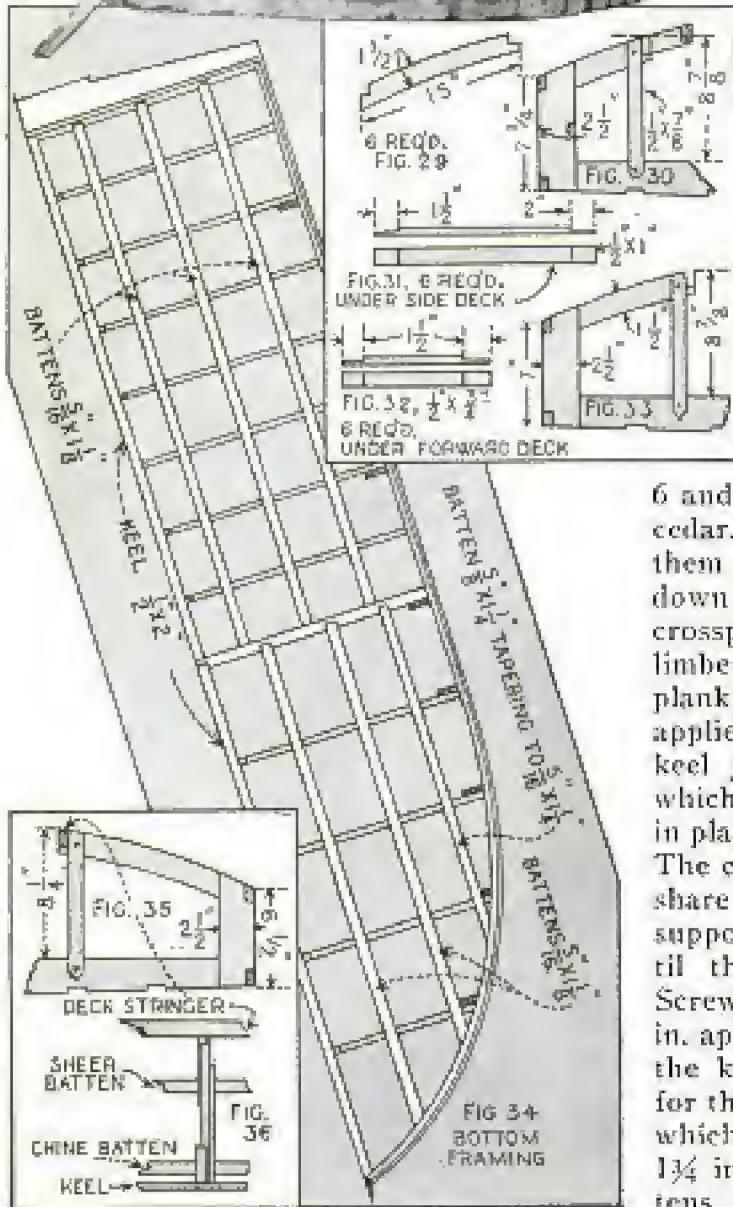
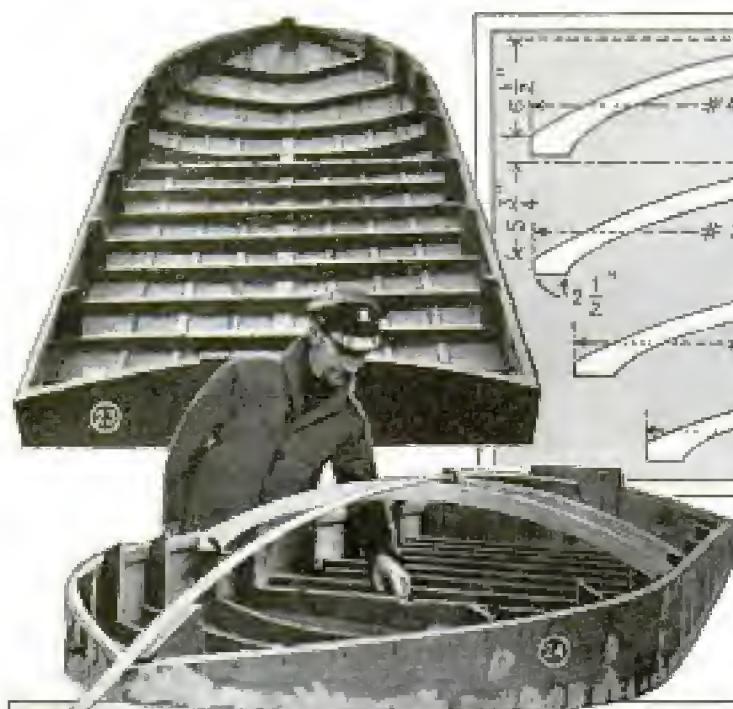
The oak chines and the deckline or sheer battens, Fig. 7, are temporarily nailed in place, and a saw is passed between the battening ends at the bow to obtain a snug fit. The sheer batten is mitered to fit alongside the nose block, but the chines are mitered into it. Start by clamping them to the step and then work toward the ends, screwing them on with No. 6 1 1/2-in. screws. In fastening the uprights of the frame to the sheer battens, make sure that



the former are absolutely vertical, with the aid of a level, as in Fig. 22. Screws in the chines are placed well away from the bottom edge of the frames to allow space for beveling the chines without interfering with the screws.

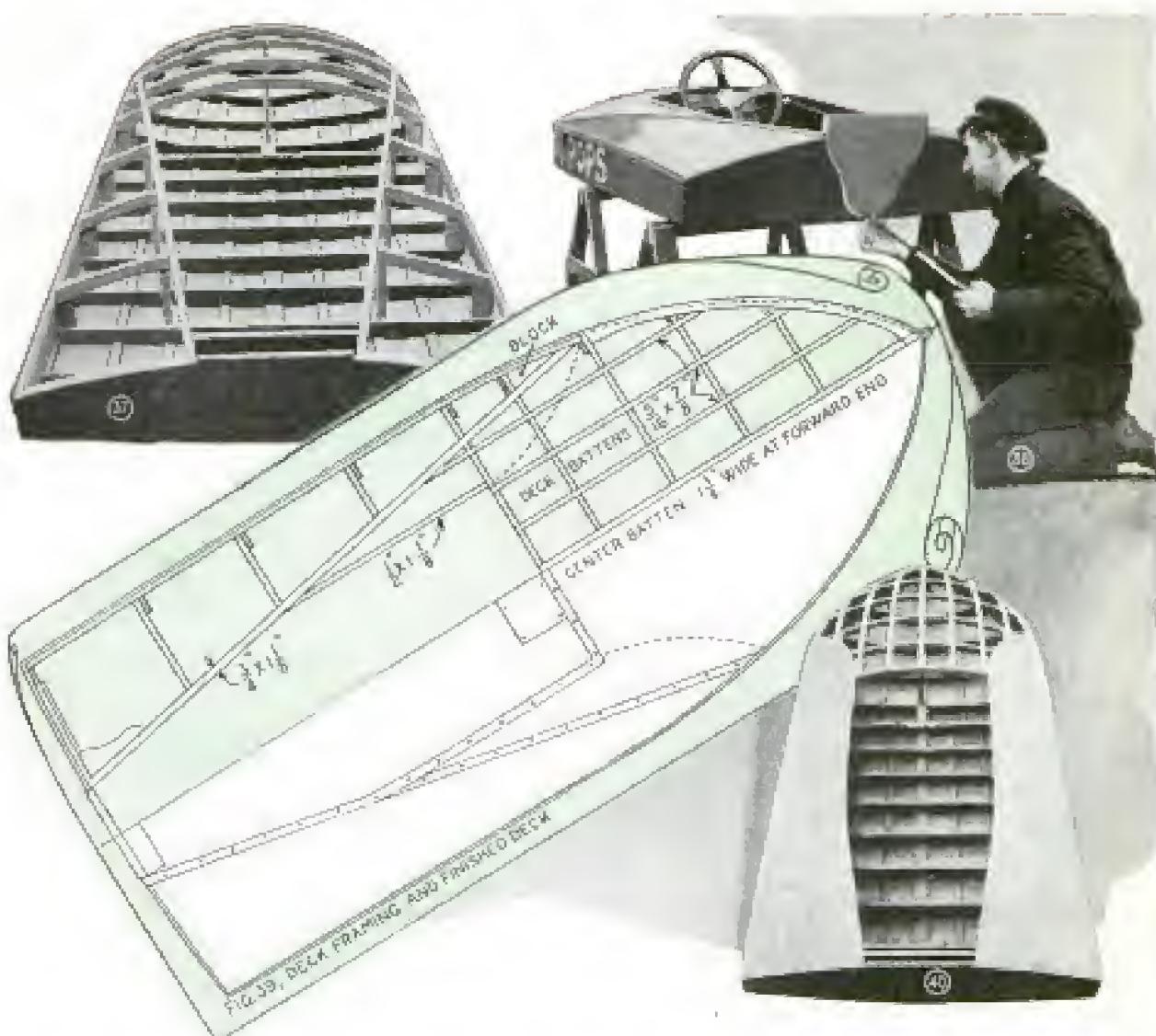
After placing six supporting props under the outer edge of the frames Nos. 2, 7 and 9, to keep the assembly parallel to the floor, the sides are applied, these being cut from two 12-ft. lengths of $\frac{3}{4}$ -in. red cedar, as in Fig. 16. First clamp the sides in place temporarily, while marking for size and checking whether there is full contact against all parts of the frame. Carefully dress and bevel the chines, sheer battens and frame uprights until this condition is obtained. Humps or hollows will cause leaks. When sawing out the sides, allow an extra $\frac{1}{4}$ in. on each side to be dressed down later, and also allow the ends to project about 6 in., so that screws will not split the wood. Before screwing the sides in place, a heavy coat of marine glue is applied over the chines and sheer battens and to the edge of the sternboard, while a lighter coat is applied to the frame uprights. The sides are first clamped at the step, then clamped to the frame at the bow, as in Fig. 15, until they are screwed to all the frames, using No. 4 $\frac{1}{4}$ -in. screws. Screws holding the sides to the chines should be spaced 2 in. apart from the stem to a point 36 in. from the sternboard,





where the spacing is reduced to $1\frac{1}{4}$ in. on account of the heavy strain to which this part of the boat is subjected. Three screws are driven through the side into each after-plane upright, while the sternboard gets a double, staggered row of screws, $1\frac{1}{4}$ -in. size for the outer row and 1-in. size for the inner row. The screws in each row are spaced 1 in. apart. In the forward plane, two screws go into frame No. 1 and three into frames Nos. 2, 3 and 4. In the deckline batten, the screws are spaced 2 in. apart from stem to stern.

After-plane seam battens are laid in notches and are spaced for 6 and 8-in. planking boards of $\frac{5}{16}$ -in. red cedar. Use $\frac{5}{8}$ -in. screws, countersinking them so that the battens can be dressed down flush with the surface of the frame crosspieces and keel. Be sure that all limber holes are cut before applying the planking. A heavy coat of marine glue is applied to the frame, seam battens and keel just before attaching the planking, which is nailed on temporarily to hold it in place while the screws are driven home. The center planks, 8 in. wide, should each share exactly one-half of the keel. The support props should remain in place until the entire boat has been planked. Screws in the after-plane planking are 2 in. apart in a double, staggered row along the keel; $1\frac{1}{4}$ in. apart along the chines for the first 24 in. ahead of the stern, after which the space is gradually increased to $1\frac{1}{2}$ in.; $1\frac{1}{2}$ in. apart along the seam battens, and 1 in. apart, in a double, stag-



gered row across the sternboard. All screws are countersunk, so that a smoothing plane can be used to dress off the entire bottom, particularly at the step. Allow the planking to project at the ends to avoid splitting when screws are driven in, after which the extending portion is cut off. The step consists of parts shown in Figs. 9, 10, 11, 12 and 13, which are cut to fit snugly, and are coated with marine glue before being permanently fastened. The end of the forward-keel and seam battens is mortised into the center of the step. To get the outer edge of the step parallel to the after-plane planking, a $1\frac{1}{8}$ -in. block is used as a marking gauge, which is slid across the planking while a pencil is held along the upper edge. Six bolts hold the two component parts of the step together.

Next comes the planking of the forward plane, the center boards of which are 8 in.

wide. A flexible batten, kept perfectly parallel to the keel, is used to determine the bevel to which the edges of the frame and chines must be dressed in order to get full contact between them and the planking. Notch the frame crosspieces and mortise the step for the seam battens, which must also be dressed down. Where the seam battens meet the chines, the butting end of the battens are toe-nailed. Sizes of the battens are given in Fig. 34, the "knuckle" battens, or those nearest the chines, being about twice as thick as the others, as the outer edge must be dressed down considerably to make them come flush. Marine glue is applied just before the planking is screwed on, the center plank being attached first, with its stem end clamped as in Fig. 14. Planks must be beveled to fit securely at the edges, after which glue is applied.

When the planking has been completed,



the hull is given a coat of paint both inside and out, after which it is removed from the keel-support board and placed right side up, as in Fig. 23. The forward deck beams, Figs. 25 to 28, inclusive, are now attached, their exact height and contour being determined by the use of a flexible batten, as in Fig. 24. Deck battens are screwed onto the beams and should project exactly $\frac{1}{16}$ in. above the beams in order to come flush with the $\frac{1}{8}$ -in. fir-plywood covering of the after deck, which projects partly over the forward deck, as shown in Fig. 40. Before applying the plywood, however, diagonal stringers are sunk flush with the after-plane beams, details of which are given in Figs. 29, 30, 31, 32, 33, 35, 36 and 39. As the forward-plane beams are rather narrow, bevel the underside of the stringers so that only a small notch has to be cut in beams Nos. 4 and 5. The deck frame, partly completed, is shown in Fig. 37. The plywood covering of the after plane is glued to the sternboard and screwed on with a double, staggered row of No. 4 $\frac{3}{4}$ -in. screws, spaced $1\frac{1}{2}$ in. apart. All other screws through the plywood are spaced 3 in.



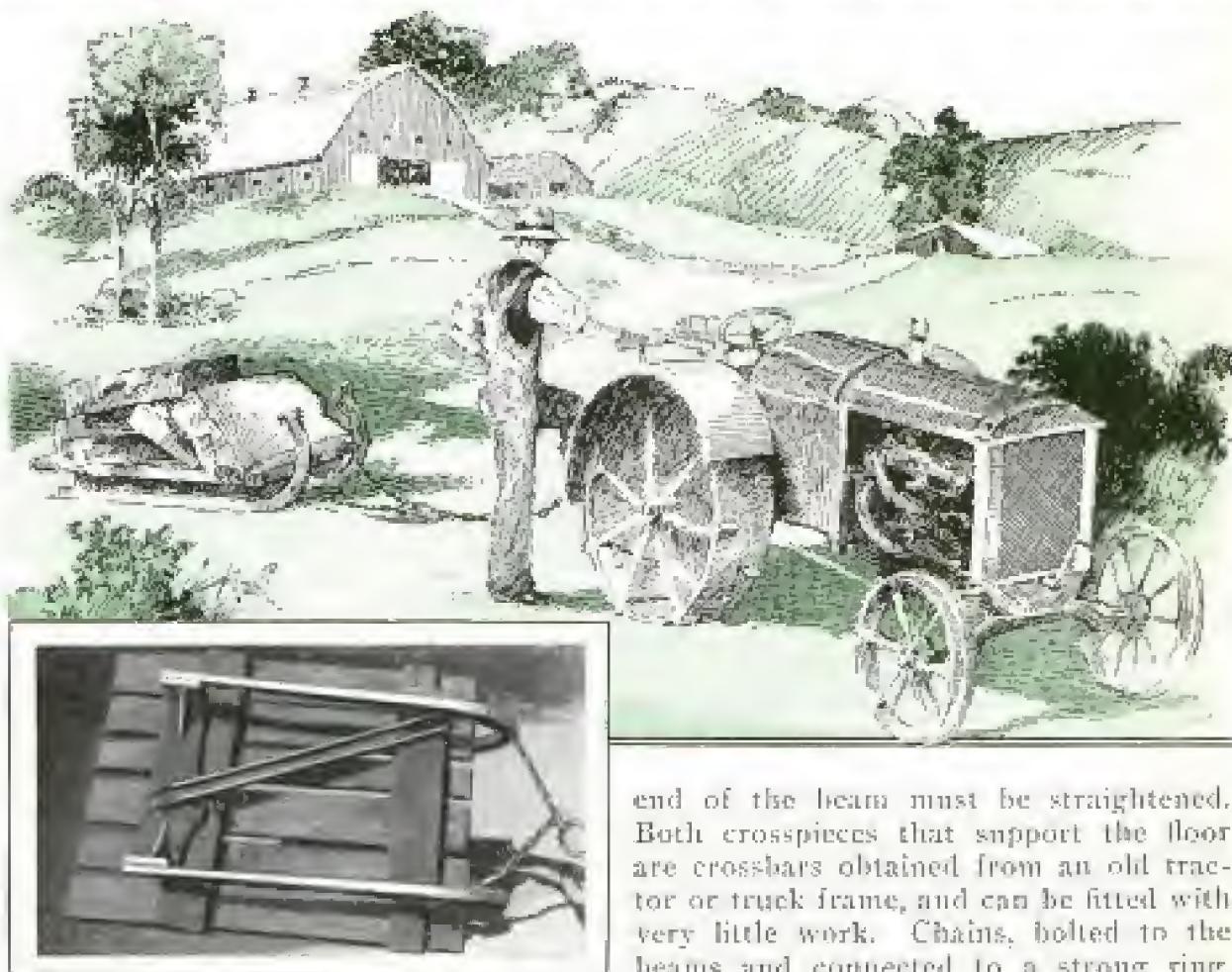
apart. Unbleached sheeting is stretched over and tacked to the entire top of the boat, as shown in Fig. 42. The cockpit is then cut out, and molding is screwed over the tacked edges of the cloth, as in Fig. 41. Three coats of clear nitrate wing dope are applied to the cloth, each coat being allowed to dry for at least 5 hours. Also sand between each coat lightly. Plywood, $\frac{1}{4}$ in. thick, is used for the flooring of the cockpit and is screwed securely to the frames. Mahogany trim adds greatly to the appearance of the boat, and a "false" stem, recessed in the nose block, completes the bow. Extra strength at the sternboard is obtained by attaching a piece of hard-

wood as in Fig. 38, using glue and screws. All screw holes must be filled with a good grade of filler, and when this is dry, the entire surface is sanded down preparatory to finishing. At least three coats of good paint are applied. A sturdy 4 by 18-in. fin, preferably cast aluminum, on the underside of the boat, about 3 in. ahead of the step, is essential.

Cord Stops Rattle of Utensils against Cupboard Door

To prevent kitchen utensils hanging inside a cupboard door from making a noise when the door is opened, stretch two lengths of heavy cord horizontally across the door, several inches below the hooks holding the pans. The cord will prevent any movement and rattle of the utensils,

Sturdy Stone Boat Has Plow-Beam Runners



Mounted on old plow or lister beams, this stone boat will stand up under almost any load. Few alterations are necessary, as most of the holes needed for the attachment of the frame members are already drilled, but the slight curve at the small

end of the beam must be straightened. Both crosspieces that support the floor are crossbars obtained from an old tractor or truck frame, and can be fitted with very little work. Chains, bolted to the beams and connected to a strong ring, form a hitch for the boat. The ends of the beams projecting above the floor should not be sawed off, since they are handy for tying the load down securely if necessary, as in the case of barrels. The boat shown is 4 ft. long and 3 ft. wide, and the runner raises it about 6 in. above the ground.

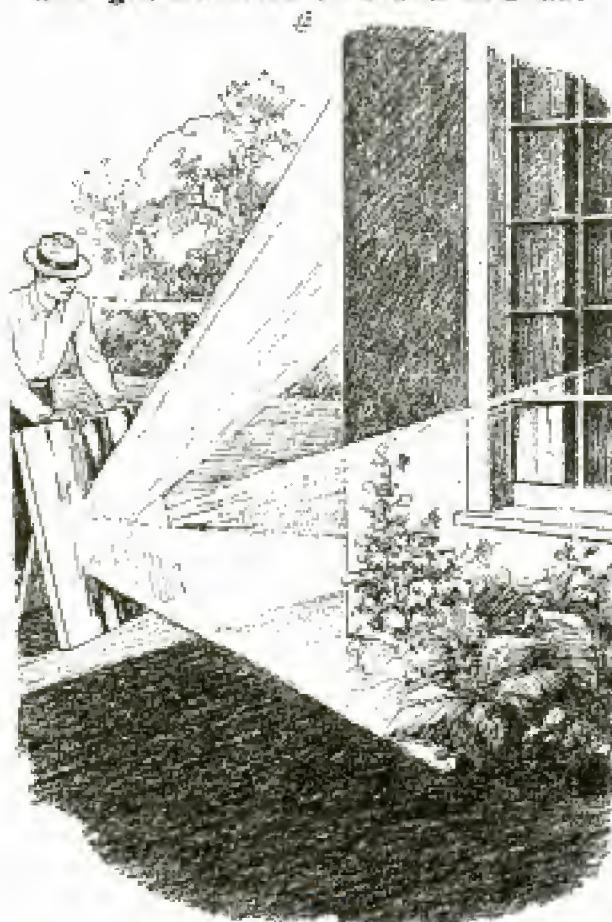
Cause and Cure of Dark Corners on Photos

Photos taken with an ordinary hand camera having high-speed anastigmat lenses, are often dark near the corners and ends. This condition is noticeable when exposures are made at high speed with the lens entirely open, or with poor light. It also occurs at the slower shutter speeds when the lens is used wide open with insufficient light, which results in underexposure. If the back is taken off such a film camera, and the shutter set open on "time" with the lens wide open, the latter will appear oval in shape when viewed

from a corner of the space normally occupied by the film, and round when viewed from the center. This effect is usually more pronounced with lenses having a small opening, but is less pronounced and often even unnoticeable in the more expensive lenses having a large aperture. Even when small lenses are fully open the corners of the film receive only a fraction as much light as the center, and for this reason the time of exposure should be lengthened, which will cure the trouble.

¶A rubber band around end ties of a toy-train track will prevent the sections from coming apart.

Sunlight Reflected on Plants in Shade



Plants on Shaded Side of Building Given Sunlight with Reflector

Flowers and young shrubbery on the shaded sides of buildings, can be induced to grow more rapidly by setting a large board painted with aluminum bronze or covered with bright tin to reflect the sun's rays on them. By using this method, the plants will soon grow strong enough to take sufficient light through their increased foliage.

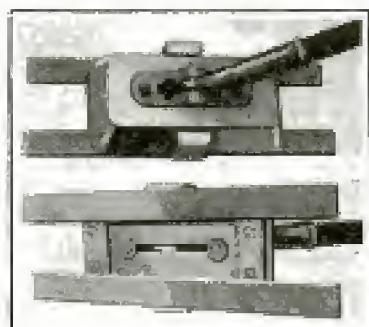
Precautions with Canned Goods

There are a few precautions that should be observed before and after cans are opened, according to the agricultural extension service of the University of Nebraska. Closed cans should have both ends flat or curved slightly inward. Neither end should bulge out or snap back when pressed. The seams of the can should be tight and clean, without any trace of leakage. Similarly, metal covers of glass jars should be firm and flat or curved slightly inward, and there should be no sign of leakage around the rubber ring. When opening, the contents should

appear sound, normal in color, and the liquid should be free from unusual cloudiness. There should be no outrush of air or spurting of liquid, which indicates spoilage, but, if, on punching a small hole through the top, there is a slight outrush of air, you can be assured that the vacuum seal has not been broken and that the contents are in good condition. The contents of an open can should be smelled at once, and the odor should be characteristic of the product. Any off-odor probably indicates spoilage. Tin cans should appear clean and bright on the inside and not excessively blackened or corroded. It is a good policy not to taste non-acid vegetables and meats before boiling them. Boiling should be continuous for 10 minutes shortly before using, even though there is no sign of spoilage. In case the liquid in the can is not sufficient to cover the solid portions, water should be added. Heating often brings out odors not otherwise noticed in cold canned fruit, which gives a basis for judging its condition.

Wood Rasps for Surfacing Floors

Two large blacksmiths' rasps, attached to a heavy floor wlexer, can be used to dress down the humps on old floors. The high points of the teeth are evened with an emery wheel, and the rasps are clamped to the floor surfacer in any convenient manner, being sure to get them parallel and on the same plane. It is best to use rather fine rasps for this purpose, and the teeth should be cleaned frequently so that they do not become clogged with paint or varnish. If linoleum is to be used as a covering, all that is needed is to level the floor, but if it is to be finished, it should be sanded down until all scratches have been removed. This can be done easily by clamping coarse sandpaper to the bottom of the floor wlexer and using in the same manner as already described.—J. H. Downie, San Antonio, Texas.



Oilcloth Finish on Cloth

Coarse canvas or cloth used to cover boxes, cases and other household conveniences may be made sanitary and washable by converting the coverings into oilcloth. Size the cloth by painting it with a solution of calcium sulphate of paint consistency. The oilcloth coating is made by boiling 1 lb. of litharge with 1 gal. of linseed oil. The oil will burn, and therefore care should be taken to prevent the fumes from reaching an open flame. After boiling for a few minutes, add Spanish whitening in small quantities, stirring with a stick until the mixture has the consistency of paint. If a tint or color is desired, dry artists' pigments may be added as needed. Use the mixture like paint. A sufficient number of coats should be applied to give the desired appearance and finish. One or two coats applied to the back of the cloth will greatly lengthen the life of the fabric.

Ammonia Removes Carbon Deposit from Spark Plugs

Automobile mechanics, who dislike the work of cleaning spark plugs in the usual

way, can apply a strong solution of ammonia which will cause the deposit to come off in flakes. The dirty plugs are immersed in the ammonia solution for an hour or two. After removing them, rap them sharply against

the workbench or some metal object, and it will be found that the carbon drops off in pieces.

Gum Makes Varnish Elastic

To give shellac varnish sufficient elasticity to prevent cracking when used for coating flexible material, such as paper or leather, dissolve from 1 to 4 oz. of camphor gum in each gallon of varnish, 2 oz. usually being enough. Care should be taken not to use an excessive amount of the gum, as it makes the varnish soft.

Portable Tool Carrier Made from Oilcan by Removing Sides and Fitting In V-Shaped Shelves



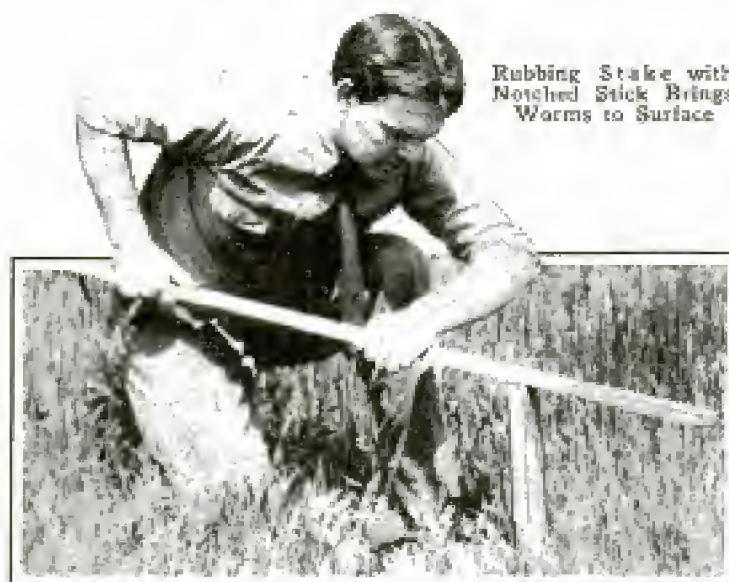
Tool Carrier Improvised from Oilcan

By removing two sides from a square 5-gal. oilcan and fitting V-shaped wooden shelves on the inside of it as shown, you can make a portable tool carrier. The shelves are nailed in place between the sides of the can and a row of nails is provided on each shelf to hold the tools.

Firing Faulty Photo Flash Bulbs

When you find a photo flash bulb with a faulty filament that cannot be fired in the usual way, place it in contact with a good one as shown, and keep it securely in place. The intense heat of the good bulb will cause the imperfect one to light. This idea can also be used to fire several bulbs at once with a single-socket holder, when greater illumination than that obtained from one bulb is needed.





Angleworms Caught without Digging

With the use of two 3-ft. lengths of 1 by 3-in. wood, you can get angleworms out of the ground without digging. Drive one of the sticks into the ground to a depth of about 2 ft. Cut notches in the

edge of the other and rub it back and forth across the top of the one in the ground. This causes vibration in the soil which will soon force most of the worms to crawl out, and it is then an easy matter to pick them up. Beating the ground with a board sometimes drives them out if they happen to be near the surface.—T. Godsey, Jefferson City, Mo.

A Simple Stamp Reverse

Sometimes it is desired to print a rubber stamp in reverse so the printed reproduction appears as though one were looking at the stamp itself. This can be done by inking the stamp, pressing it lightly against a fresh piece of art gum, and then pressing the gum against the paper. Sufficient ink will adhere to the gum to reproduce the design on the stamp.

\$2,500 in Cash for DeWitt Clinton Models

POPULAR MECHANICS offers cash awards for the best models of the DeWitt Clinton train made by persons residing in the United States and Canada.

First Prize, \$1,000 in cash, and a week's visit to New York via the New York Central's Twentieth Century Limited.

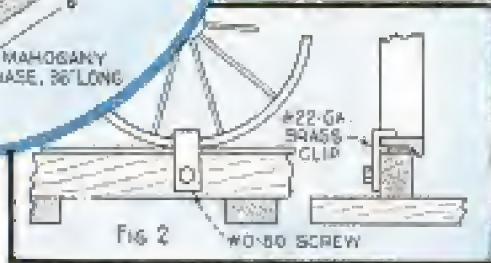
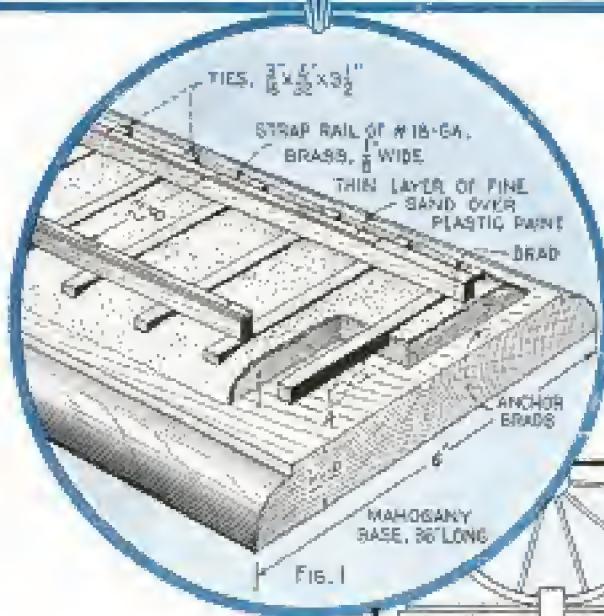
Second Prize, \$500 in cash, and a week's visit to New York.

Third Prize, \$250 in cash, and a week's visit to New York.

In addition, there will be five prizes of \$50 each, and ten of \$25 each for the next best models. In the event of a tie for any prize offered, a prize identical in all respects with that tied for will be awarded to each tying contestant. Should the winners reside in the east, a trip to Chicago may be substituted for the New York trip. The judges of the contest will be Mr. Reginald H. Claudius, H. H. Windsor, Jr., editor and publisher, and officials of the New York Central railroad. The date for closing the contest is 12:00 p. m., Dec. 31, 1932.

Contestants are required to submit photographs of their models and, in case of necessity, the model itself may be requested for inspection, but will be returned. Models must be built to the scale and of the material prescribed in the Jan., Feb., March and April, 1932, issues of Popular Mechanics. All parts must be finished as specified and the painting scheme in the last installment must also be followed. Blueprints of the locomotive, tender and coaches are available. As a special service to those building this model, Popular Mechanics will furnish No. 0-80 screws and nuts per package of 100 each for 75 cents. A material list, and information concerning cost of materials, where to obtain them, etc., will be sent free upon request.

ROADBED and TRACK for DEWITT CLINTON Train



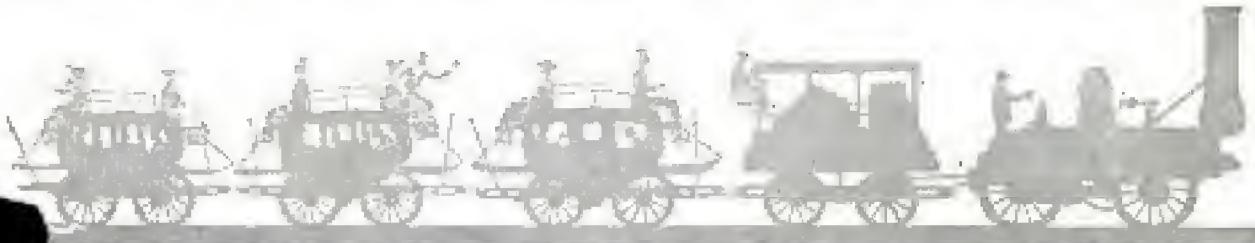
WHEN you have finished the De Witt Clinton model, it should be mounted on a miniature roadbed, the construction of which is shown in Fig. 1. The base is of $1\frac{1}{8}$ -in. stock, preferably mahogany, 36 in. long and 6 in. wide, with the edges molded as shown. Yellow pine is used for the rails and ties. The former are cut $\frac{3}{16}$ by $\frac{5}{8}$ by 3 1/2 in., and the ties are $\frac{3}{8}$ by $\frac{5}{8}$ by 3 1/2 in. After cutting, the top face of each tie is roughened or scalloped with irregular knife cuts as in Fig. 3, to represent the rough-hewn appearance of the original track.

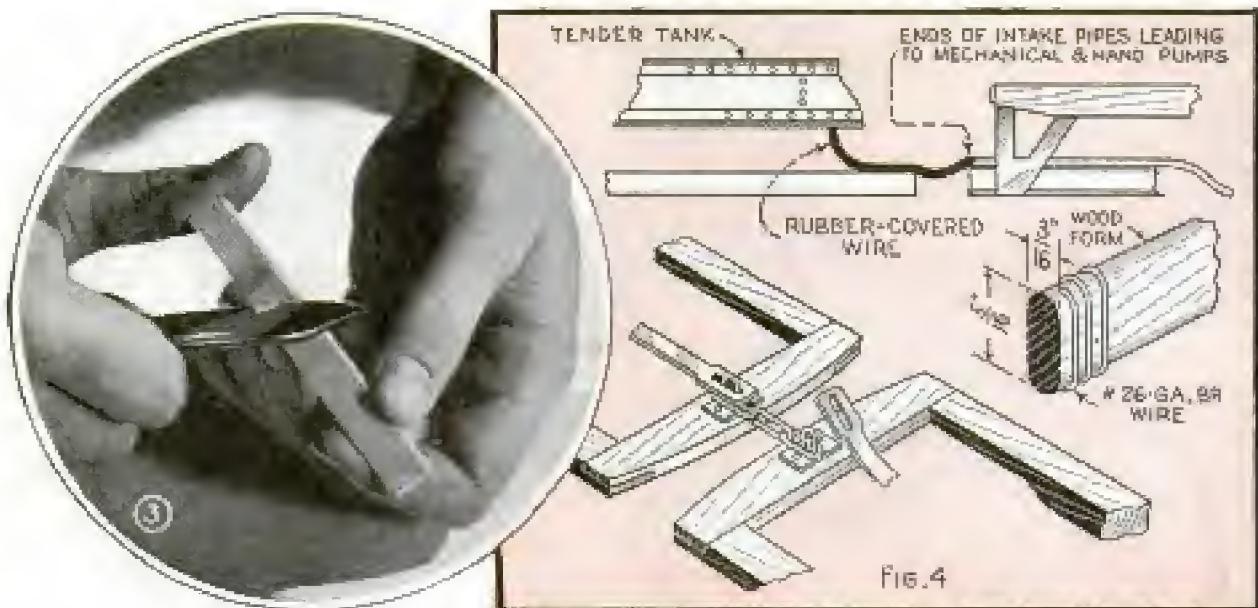
After the base has been cut to size, molded and carefully sanded, the edges, if some other wood is used, are stained dark mahogany or they may be finished dull black. The stained portion of the edge



need be only about $1\frac{1}{2}$ in. wide, as the remainder is covered by the roadbed. When the stain is thoroughly dry, fill the stained portion and after light sanding, finish with two thin coats of shellac.

Next, assemble the track by spacing the rails to allow a distance of $2\frac{3}{4}$ in. between them, with the ends of each tie projecting equally beyond the outer edges of the rails. Drive a $\frac{3}{16}$ -in. brad through the rail and into the tie as shown. The projecting ends of the brads are not clinched over, but are left straight to better anchor the track to the roadbed. The ties are spaced approximately $1\frac{1}{2}$ in. apart, center to center. It is necessary to be careful that this distance is uniform throughout the full length of the track. With the rails in place, the straps to cover them are cut $\frac{1}{8}$ in. wide from No. 18-gauge brass, and





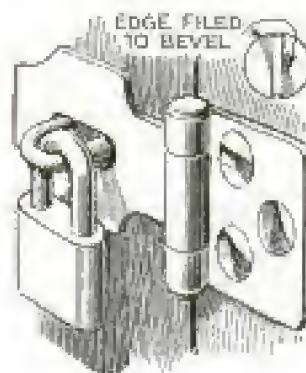
holes drilled with a No. 60 drill are spaced approximately $1\frac{1}{2}$ in. apart along a center line on each strap. Brad the rails in place with ordinary pins, the latter being cut about $\frac{3}{16}$ in. in length. After the rail straps are in place, the heads of the pins are filed back nearly flush. The joints of the straps on each rail are staggered, and when fastening the straps, it is necessary to be careful that the edge of the latter is flush with that of the wooden rail. The grading for the track may be made from either of the various kinds of plastic paint or gesso, covered with sand to give a realistic effect. The plastic paint must be thick enough to prevent its running, as it must be built up to a height of approximately $\frac{3}{8}$ in. on the base. Before applying the grading to the base, drive in a number of brads, allowing the heads to project about $\frac{1}{4}$ in. above the surface to anchor the grading. This done, the plastic paint is applied to a slightly rounding and irregular contour, care being taken to keep the outer edges as nearly straight as possible. The width of the grading should be about $4\frac{1}{4}$ in. throughout the length. The track is then pressed into the grading until the top of the ties just come above the surface. Any irregularities are then smoothed out with a putty knife or other suitable tool. Immediately before the material sets, it is uniformly sprinkled with fine, clean sand which is worked into the surface, and the excess carefully brushed away.

After the roadbed has hardened, the ex-

posed portion of the ties and rails may be protected with a thin coat of white shellac, although this is not necessary. The locomotive, tender and coaches are next placed on the track and the chain couplings are made as shown in Fig. 4. This is done by winding a length of fine wire about a wooden form after which the wire is removed, cut and soldered to form links. One link of the coupling from locomotive to tender is soldered onto the eyebolt at the rear of the engineer's platform. Two short pieces of fine rubber-covered wire represent the hose connections between the tender and the water pumps on the locomotive, as also shown in Fig. 4. After the train has been coupled, the wheels are fastened onto the track with clips, as in Fig. 2.

Making Wood Screws Foolproof

Screws that have the slots in the heads filed away at a bevel, as shown in the detail, cannot be removed by a screwdriver in the usual way. The beveled slot permits the screw to be driven into the wood, but the screwdriver slips out when it is turned in the opposite direction.—G. W. White, Severn Park, Ontario.



Tracing Enlarged Magazine Pictures on Wall

Many magazine and book illustrations for the making of home-workshop projects are greatly reduced in size and therefore it is desirable to have a projector for enlarging them. The drawings need not



This Projector Is Used for Enlarging Home-Workshop Drawings in Magazines and Books on the Wall

be clipped out, as the projector is placed directly over the magazine page, and a brilliant enlargement is projected on a sheet of drawing paper on the wall, where it may be traced. The device is also useful for viewing pictures in the family album without removing them. The upper right-hand drawing shows the projector with one side removed. In the rear is a mirror set at a 45° angle, to reflect the picture through the lens in the front. A projector of the size given will handle practically any work, covering, as it does, a large magazine page. Correct cutting of the back, top and sides is essential.



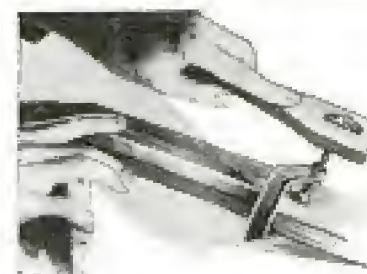
Center the mirror very carefully on the inside of the back, with cement at each corner to hold it securely. The lens, which may be obtained from an old camera, must also be accurately centered on the front, and should be mounted in a telescoping tube for focusing. With an average lens, two 50-watt lamps will provide ample illumination.

Headless Bolts Hold Gasket While Replacing Cylinder Head

Here is a good method of keeping the gasket in place while you maneuver a cylinder head into position. Take three or four cylinder-head bolts, with the heads removed, and screw them partly into the motor block, one at each end, and one on each side at the center, so that they project more than the width of the cylinder head. The head will slip over the bolts much easier if the ends have been rounded off. Next slip the gasket on over them so that it will be securely held in place until the head is set in position, after which the bolts can be removed with the fingers or a

pair of pliers and the cylinder head tightened in the usual way.

Tool for Tightening C-Clamp



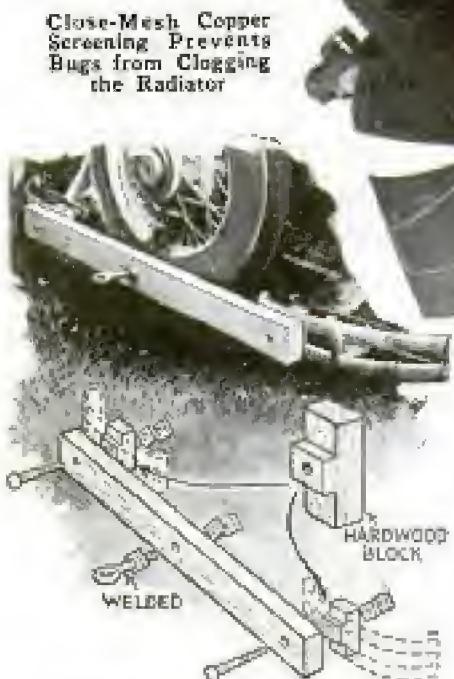
To tighten the screw on a C-clamp, a piece of close-grained hardwood, with a slot cut in one end to fit the wingnut, is useful. This improvised wrench is handy, as it can be employed to tighten or loosen any type of wingnut.



PRACTICAL SUGGESTIONS for the CAR OWNER



Imitation-Leather Lining on Lower-Priced Roadster Is Easy to Replace; Linoleum Having Grained-Hardwood or Plain Finish Makes a Serviceable Repair; the Original Panels Serve as Guides in Fitting the New Pieces



Above, Quickly Improvised Trailer Hitch Attached to Rear Bumpers of Car; Drawbar Is of Hardwood Fitted with a 3/4-In. Eye Bolt and Two 5/8-In. Nuts; Below, Copper Tubing Attached to Hose Is Effective for Cutting Mud from Underside of Fenders



Lighted Bulb Warms Up Carburetor on Cold Mornings and Makes Starting Easier



Below, When Door Stops Lose Their Efficiency Rattles Can Be Silenced by Rubber-Headed Tacks on the Jamb



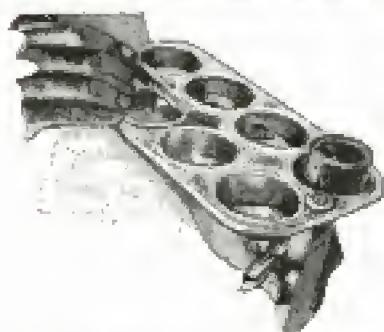
Solution for Copper Etching

Delicate lines may be accurately etched in copper with a solution consisting of 13 oz. of ferric chloride solution (U.S.P. iron chloride) and 5 oz. of ordinary table salt. The work is first given a coating of melted paraffin applied with a brush. When the paraffin has hardened, scratch in the lines to be etched. Writing produced with a stylus on such a wax-treated surface may be very accurately reproduced. Then cover the work with the above solution and allow it to stand until the etching is sufficiently deep. The solution may be washed off and more used if deeper lines are desired. The slower and less corrosive action of this solution, as compared with that of nitric acid, makes it preferable in many cases.

Cleaning Used Bricks with Shovel

An ordinary shovel is a good tool for removing mortar on used bricks. One end of the brick is butted against a solid object, and the other is set on another brick. The mortar is then scraped off with the shovel by turning the latter back side up and applying foot pressure.

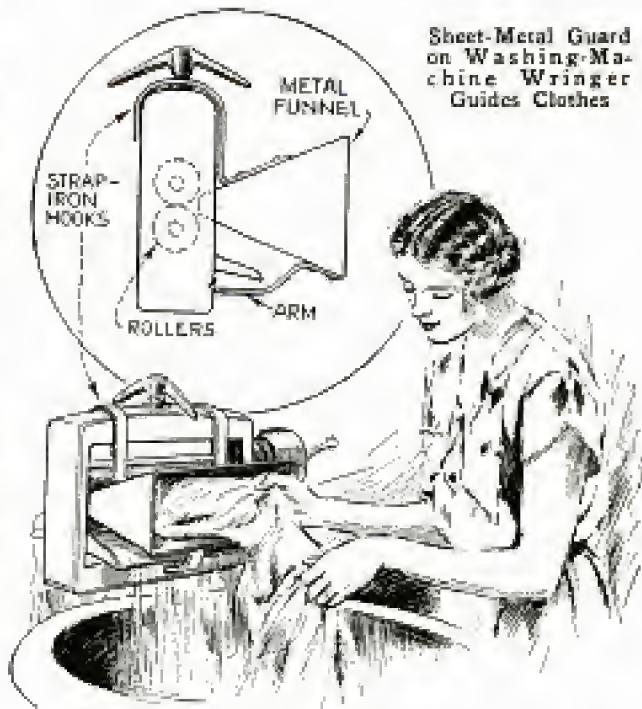
Muffin Pan Serves as Artist's Palette



to one end, and in use, the pan is held on the forearm in the usual way. Seven colors can be carried at one time, the eighth depression being used to hold a small can of mixing liquid.

Cam Follower from Casters

When building an experimental machine, which involves the use of a cam, the homecrafter will find that a caster, properly mounted, makes a good cam follower. The shank of the caster can be altered to suit the purpose and special parts welded to it, if necessary.

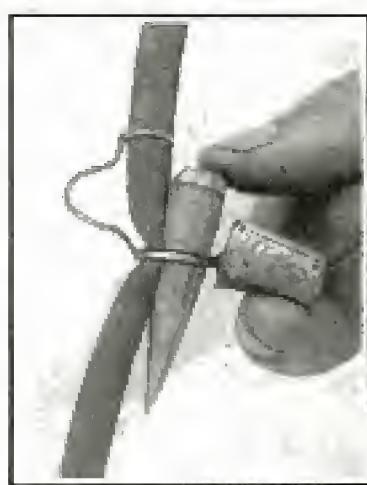


Funnel Increases Safety of Wringer

Besides being a safety feature on the washing machine, this funnel helps to guide the clothes between the wringer rollers. The funnel can be made of either sheet metal or thin wood, the same length as the roller. Strap-iron hooks are used to hang it on the wringer frame, while a short arm is screwed to the underside to keep the funnel from touching the rollers. The opening at the small end should be no wider than 1 in., while that at the large end may be 6 or 8 in.

Ring and Wedge Choke Small Hose

You can improvise a choke for the garden hose by using a ring or corkscrew and a wedge-shaped wooden pin. The hose is run through the eye in the corkscrew and tied with a cord, after which the pin is inserted to compress the hose as shown. This will shut off the flow without doing any damage to the hose.



SAVINGS made by Building this



By
R. O. BUCK
of the
Lane Technical
High School
Chicago

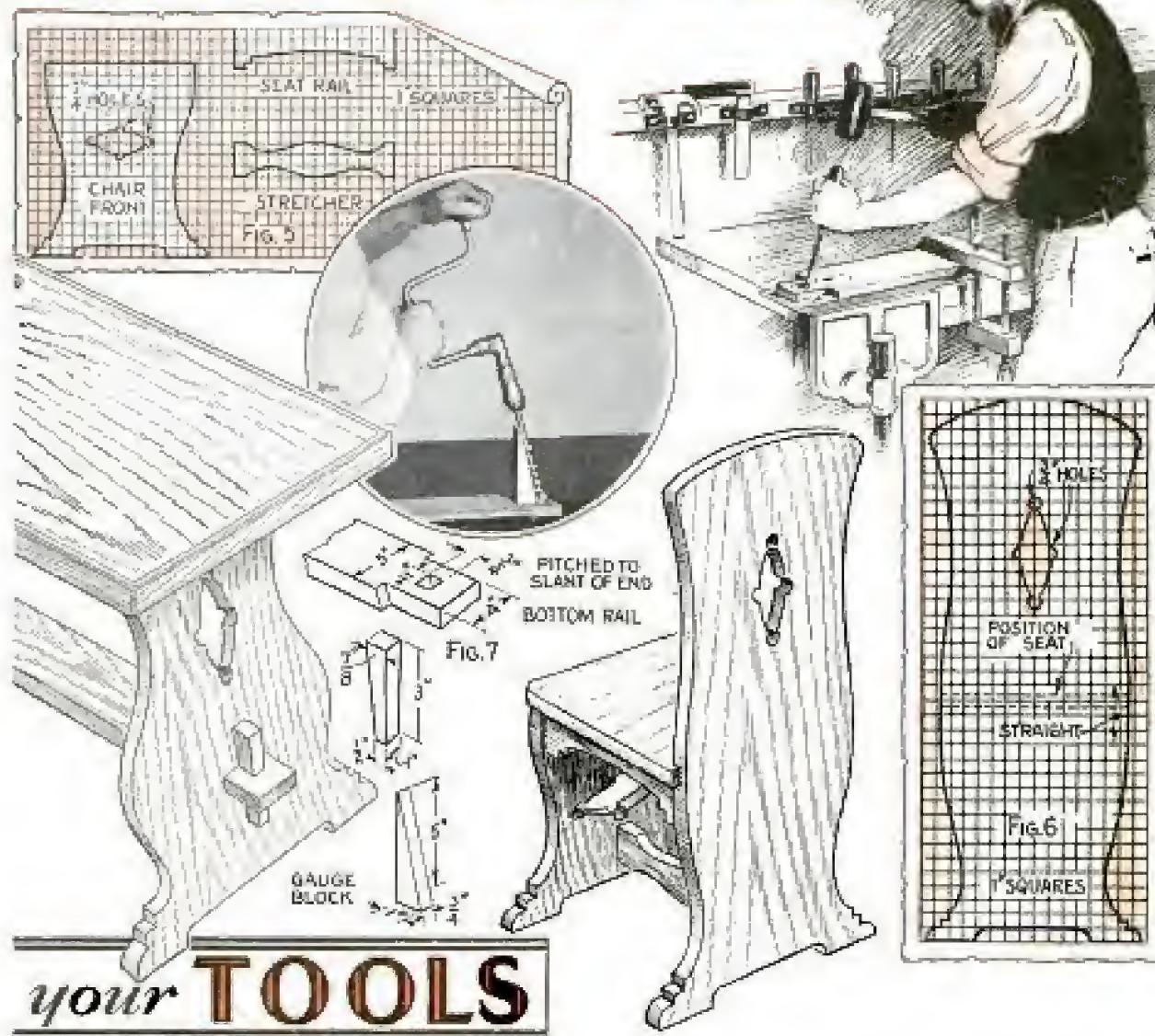
HERE is an attractive breakfast set that can be made with the regular tool equipment of the average home—a hammer, screwdriver, plane, chisel, saw, file and a keyhole or turning saw. No special knowledge of woodwork, beyond the most rudimentary operations, is required, and the pieces can be made of inexpensive soft wood and finished with paint, lacquer or enamel.

The table top is made of $\frac{3}{4}$ -in. stock, with a $\frac{3}{8}$ by $1\frac{1}{4}$ -in. band around the edge, flush with the top, to produce the appearance of greater thickness. There are three ways to make the top, namely, by gluing up $\frac{3}{4}$ -in. stock to width, with dowels for fastening the pieces together; by using

$\frac{3}{8}$ -in. plywood reinforced underneath with cleats, or by making a top of common tongue-and-groove boards cleated together. The second method is the most expensive. If desired, the top can be covered with linoleum, the $1\frac{1}{4}$ -in. band being raised flush with the surface.

The table is of the Dutch type having raked ends and a keyed crosspiece, which prevents the ends from spreading. Lay out full-size patterns of the table ends and cut them to the shape shown in Fig. 3. The top and bottom edges are beveled slightly to the angle or rake, as well as the mortise through which the keyed tenon extends. If two gauge blocks, similar to the one shown in Fig. 7, are made, they

BREAKFAST SET



your TOOLS

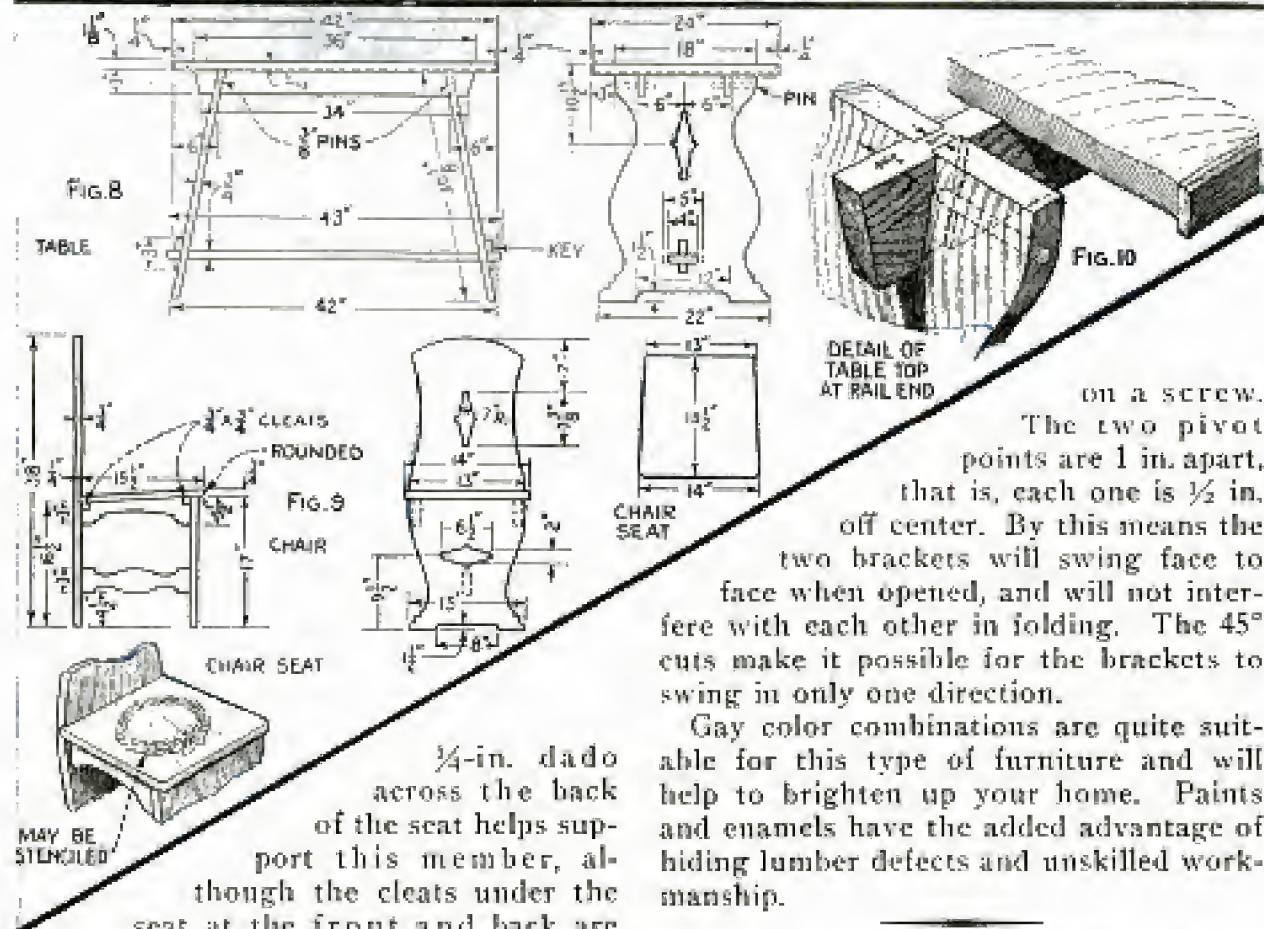
will help in cutting the mortise at the correct angle. Lay the blocks on the bench with the 5-in. edge down, then place the endpiece on them so that, when you bore holes vertically, they will be at the proper slant. The mortise is then trued up with a chisel and file. Fig. 7 also gives the details of the key tenon on the ends of the cross rail. The top rails, which fit into the slots at the top of the endpieces, are dadoed out on the sides as shown in Fig. 1, so that they lock the ends together, and, with the bottom rail, make a rigid assembly. The gauge blocks give the slant of this dado. Notice the counterbored pockets for screws that hold the top in place. Sand the pieces carefully and assemble.

No glue is required. The upper rails are fastened by boring and driving a dowel pin through from the edges, as shown in Fig. 10. These are glued into place. The keys are driven through the joint far enough to draw the ends up snugly against the shoulders of the cross rail, after which the pins are secured by driving a small brad through the lower part of the key to prevent it from working up.

Figs. 5 and 6 show parts of the chair, also made of $\frac{3}{4}$ -in. stock. The cut-outs are similar to those on the ends of the table, and the dimensions of the vertical one in the chair back may be the same as that on the table. The chair is assembled with round-head screws, glue and cleats. A



The simplest method of supporting the leaves is by means of swinging brackets, shown in Fig. 4. Cuts are made at a 45° angle in the top rails to a depth of $1\frac{1}{2}$ in. No attempt is made to use the material cut out of these slots, but pieces are made to fit loosely in the openings, as shown. A hole is drilled through the bracket pieces large enough for the piece to turn freely



$\frac{1}{4}$ -in. dado across the back of the seat helps support this member, although the cleats under the seat at the front and back are depended upon for the rigidity and strength of the chair. These cleats are glued and screwed from the front and back, as the screw heads are not objectionable at these places. The side rails stiffen the whole assembly and form a sturdy and pleasing chair.

As the table is intended for two, only two chairs are required, but it may easily be converted into a table for four by the addition of leaves. The leaves, $\frac{3}{4}$ by 8 by 42 in. in size, are simply hinged to the top, the band around the edge being omitted.

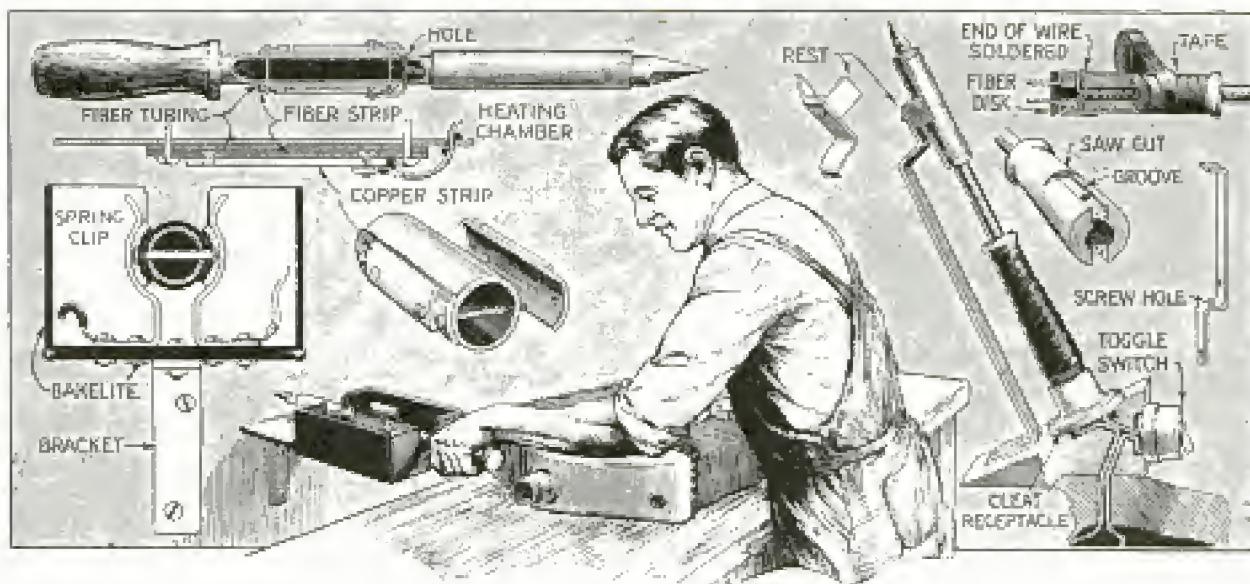
on a screw. The two pivot points are 1 in. apart, that is, each one is $\frac{1}{2}$ in. off center. By this means the two brackets will swing face to face when opened, and will not interfere with each other in folding. The 45° cuts make it possible for the brackets to swing in only one direction.

Gay color combinations are quite suitable for this type of furniture and will help to brighten up your home. Paints and enamels have the added advantage of hiding lumber defects and unskilled workmanship.

How to Prepare Fire-Stained Walls Before Painting

Before painting walls that have been stained and streaked by fire, wash the stains with warm water and a strong washing powder, and rinse. Then scrape off the paint from the spots and remove any alkaline material on the plaster with a solution consisting of zinc sulphate, 2 lb., and water, 1 gal. Allow the wall to dry and apply a coat of good primer, tinted to the approximate color of the finishing coat.

Electric Soldering Iron Heated Without Cord

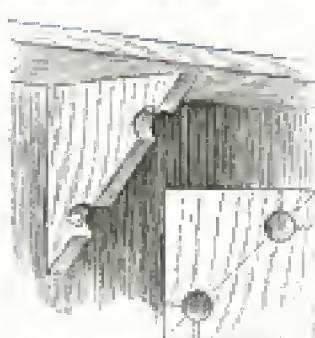


Cords on electric soldering irons can be eliminated permanently. Two methods of accomplishing this are shown in the drawing. The right-hand details show how two brass prongs can be attached to the end of the handle, the ends of the prongs being bent together to fit a standard plug. Two shallow grooves are cut on opposite sides of the handle to take the brass strips, and holes are drilled to permit connecting the wires inside. After the assembly is completed, the handle is wrapped with tape to insulate it. A convenient base and holder for the altered iron consists of a wedge-shaped block, with a porcelain receptacle and a flat-iron rest mounted on the upper face, and a toggle switch on the side. The holder is then fastened to the bench and the wiring brought up through

the bench top. A variation of this idea is shown in the left-hand details. A length of fiber tubing is slipped over the shank of the iron, and two holes are drilled near the ends for screws that hold it in place. Two fiber strips, of the same length as the tubing, are then riveted to copper plates about 1 in. shorter, after which the strips are drilled and assembled on opposite sides of the tubing, where they are held in place with the screws. Two holes, drilled through the shank of the iron, allow the wires inside the element to be brought out and connected to the copper plates. Current for heating the iron is obtained from two spring-brass clips mounted on a bakelite base, the copper plates making contact with the strips.—Thomas Moore, Detroit, Mich.

Easily Made Shelf Brackets

Where beauty is not a factor, shelf brackets can be quickly made from a square piece of wood, the size and thickness of which, of course, depend on the size of brackets desired. First, two 1-in. holes are drilled through the stock near the corners on a



diagonal line as shown. Small screw holes are drilled into the holes at right angles to the edge, after which the piece is sawed in half along the diagonal line.—Anthony E. Zipperich, N. Y.

Moth Balls Drive Away Moles

Federal experts find that a good method of driving away moles from a lawn or garden is to drop one or two moth balls in their runways. The pests dislike the odor and will keep away from it. If there is a large number of moles around, trapping should be resorted to.



Chicken Wire Spread over Flower Bed Keeps Dogs from Digging Up the Soil

Wire Mesh Keeps Dog from Digging in Flower Bed

Wire mesh spread over a flower bed will keep dogs from digging up the soil. The wire does not interfere with the growth of the young plants, and before they become too large, the netting easily can be removed.

Auto Jack for Loosening Boards from Box without Breakage

In salvaging thin boards from empty boxes, care must be taken to avoid breaking or splitting them. An auto jack and a wooden crosspiece, applied as shown, enables you to dismantle a box without damage to it.

The jack exerts a steady and even pressure on both top and bottom boards and forces them apart. The ends and sides of the box can then be twisted loose without difficulty.

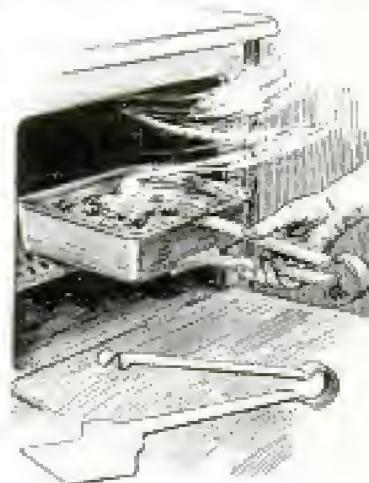


Fishing Crappies with Aid of Float

Appreciating the fact that crappies travel in schools and that they may get out of the fisherman's range quickly, one enthusiast has found that the location of the school can be determined as follows: Get a piece of fish line or cord of a length equal to the depth that the school is located from the surface of the water. Tie one end of the cord to a member of the finny tribe already caught, and the other to a burned-out light bulb. Release the fish so that it will swim back to the school, with the bulb floating on the surface. By following the bulb, you will continue catching fish as long as they bite.—J. W. Reynolds, Mattoon, Ill.

Hot Pans Easily Removed from Oven with Sheet-Metal Tongs

Hot baking pans are easily removed from an oven with the illustrated tongs, which are made of sheet metal. The metal is bent double with a loop at the center to give it a spring effect. A hook is formed on one end to fit over the top edge of the pan, while the other end has a short right-angle bend made to fit the bottom of the pan. The latter end is also wider than the hook end as shown, in order to prevent the pan from turning sideways.



Solution Helps Catch Butterflies

Butterflies can be caught by using the following preparation, mixed over a gentle heat: honey, 10 oz., cumarin sugar, 45 gr., and apple ether, 1½ fluid dr. Smear this mixture on thick woolen yarn, and, toward dark, wind the yarn around and in the tops of bushes. The butterflies will be attracted to the yarn and if you go out after dark with a light they will be blinded and you can catch them with your hands.



Artistic ENTRANCE UNIT of Sheet Metal *Combines*



by
A.C. Ulrich

COMBINING all entrance features in one, this unit is made of sheet copper and is given a hammered finish.

The back plate, Fig. 11, should be made first from sheet aluminum or copper, about $\frac{1}{16}$ in. thick, $11\frac{1}{4}$ in. wide and 12 in. high. Cut out a pattern, which is cemented to the aluminum. Then drill all the holes and saw out the design by hand or with a scrollsaw fitted with a metal-cutting blade. File the edges smooth and remove the paper. Next cut out the house numbers from the same stock and then install a lamp receptacle and push-button switch on the back, in the position indicated in Fig. 13.

The top of the mail receptacle, shown in Figs. 7 to 10, inclusive, is then cut out from No. 22-gauge sheet copper, $13\frac{1}{8}$ in. long and $7\frac{1}{8}$ in. wide, also using a pattern. Cut the outside design with a pair of tin snips, drill the necessary holes, and then chisel out the end openings, after which the metal is bent to shape and rivet-

House Numbers
Nameplate . . .
Lantern . . .
Mailbox . . .
Bell . . .

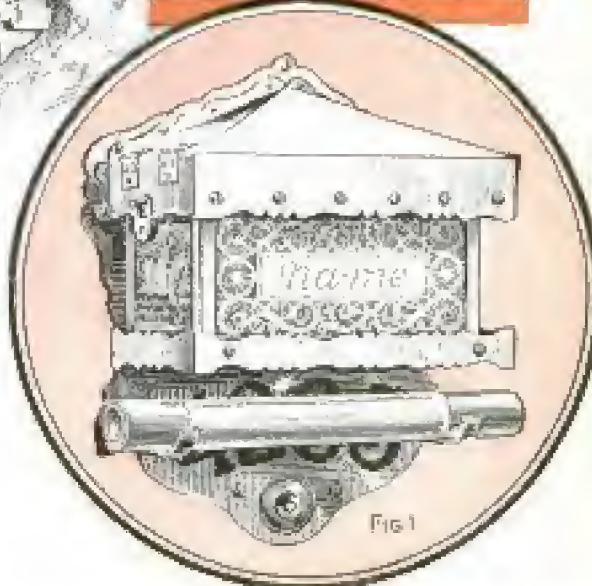
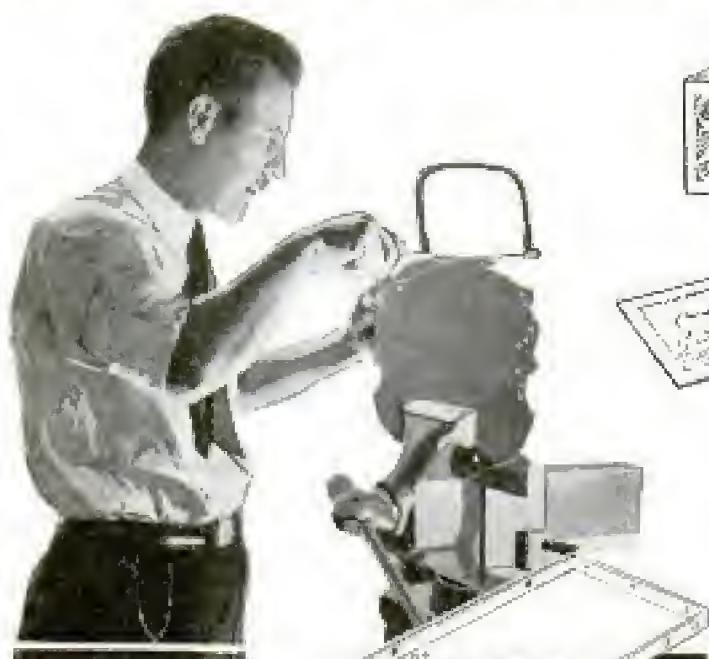


Fig. 1

ed to the bottom, shown in Fig. 2, with copper rivets. If you like, the exposed parts can be finished with a ball-peen hammer to obtain the hammered effect. A staple, bent from heavy copper wire, about $\frac{3}{16}$ in. in diameter, is inserted in the holes drilled to receive it, and the ends are bent and soldered to the metal, inside of the box. The mail-inlet door is cut out to slip over the staple to permit padlocking, and is hinged in place, being finished to match the top. No cover is provided for the mail-inlet opening.

Next comes the lamp compartment, which has a $\frac{1}{2}$ by $\frac{1}{2}$ -in. angle-brass frame, as shown in Figs. 3, 4 and 12. The per-



forated shell that covers the frame is cut from No. 32-gauge copper as shown in Fig. 14. Any suitable pattern can be used, and the holes are perforated with a sharp punch made from a 10-penny nail as shown in Fig. 6, the work being laid on a block of soft wood which is free from knots. The exact size of this piece is $3\frac{1}{8}$ by $17\frac{3}{8}$ in., and it is bent at right angles at two points to fit the framework. Be sure to place the name in the center section where it can be seen at night when the lamp inside shines through the perforations. After this has been riveted to the top and bottom parts of the frame, a strip, or rail, of heavier copper is cut to the shape shown in Fig. 5, and is riveted or bolted to the bottom of the lamp compartment, using sleeves to space it about the same distance that the mail receptacle projects, which can be determined by temporarily assembling the parts. Figs. 12 and 13 show the sleeves. To correspond

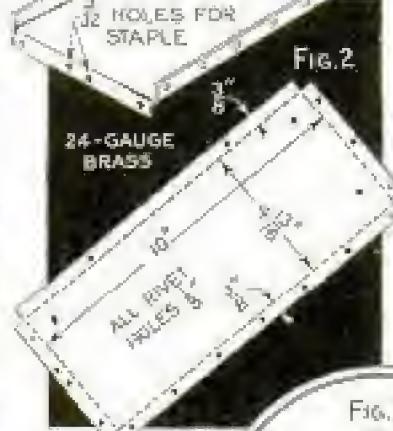


Fig. 3
BENDING
BRASS ANGLE

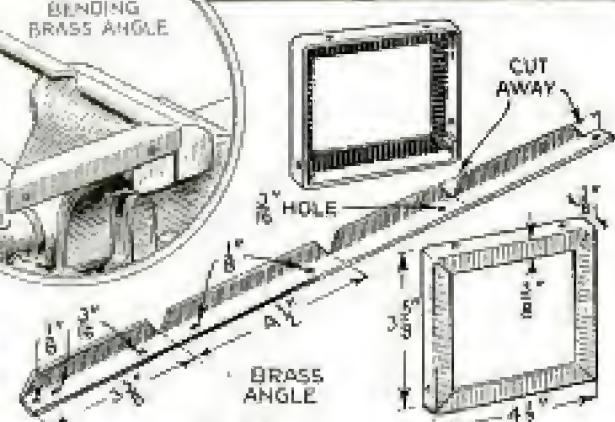


Fig. 4



Fig. 5

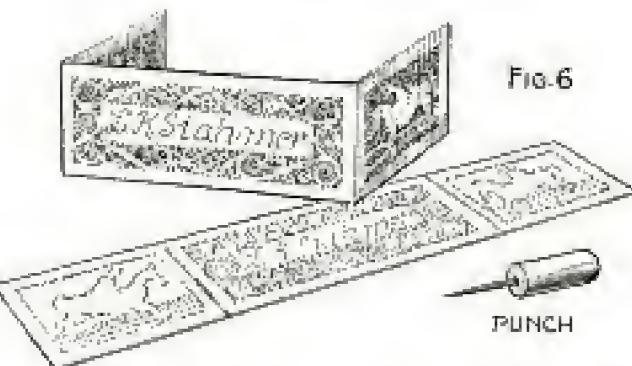
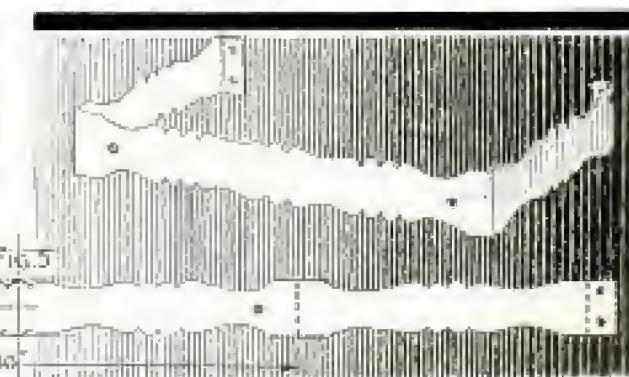


Fig. 6

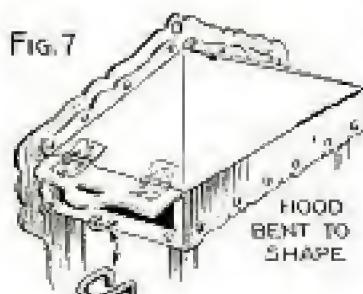
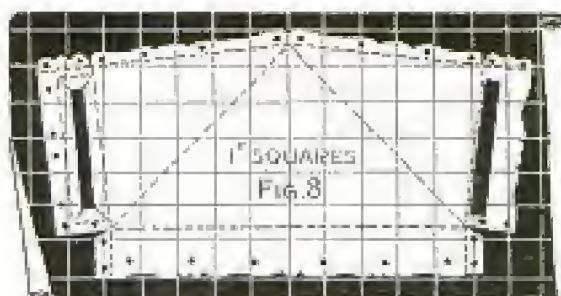
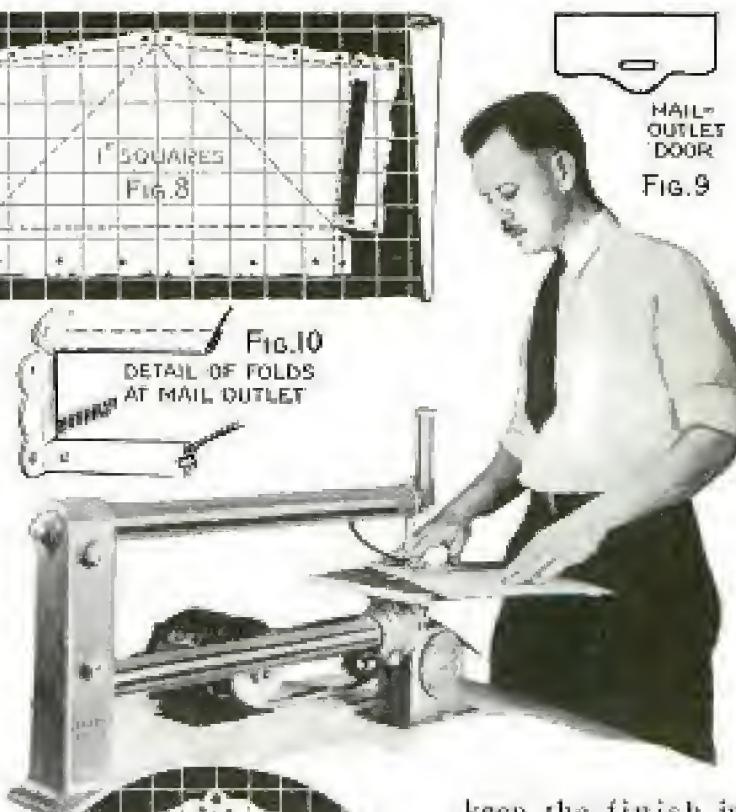
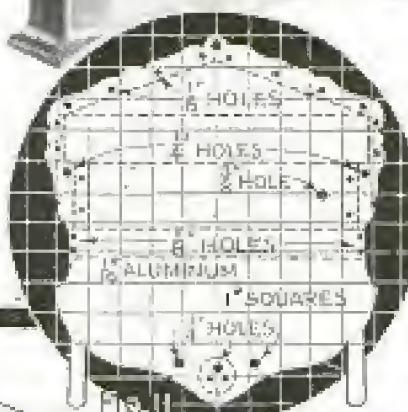


FIG. 7

MAIL-
OUTLET
DOOR
FIG. 9

should correspond to the rest of the unit. The members, however, should contrast strongly with the back plate to which they are riveted. Contrast can be obtained by using copper against aluminum, or vice versa, or by painting the numbers in a different color. It should be noticed also that there is no bottom to the lamp compartment, which makes it possible to illuminate the house numbers at night. For a final finish, you may wish to have the depressions in the copper black and the high spots polished brightly. This is done by rubbing a solution of liver of sulphur on the copper, which turns it black, and polishing the high spots with a pad. To



keep the finish in this condition, coat with transparent metal lacquer. A corroded green finish can be obtained by applying a solution of common table salt and vinegar, and letting it dry on the copper before rubbing with a dry cloth.

In assembling the lantern, the lamp receptacle is wired with No. 14 rubber-covered wire, leaving the conductors projecting through the back of the unit so that they can be run into the wall on which the unit is mounted, connection being made to the 110-volt line and to a switch inside. A copper-finished padlock should be selected to harmonize with the finish and the screws holding the lantern also should correspond.

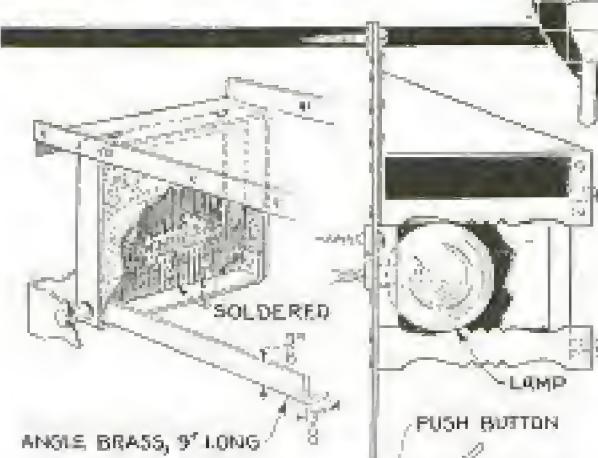
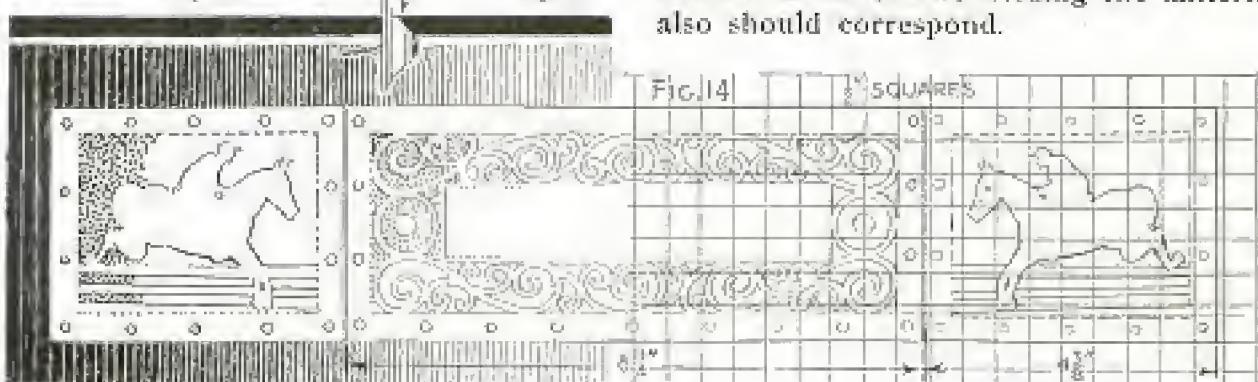
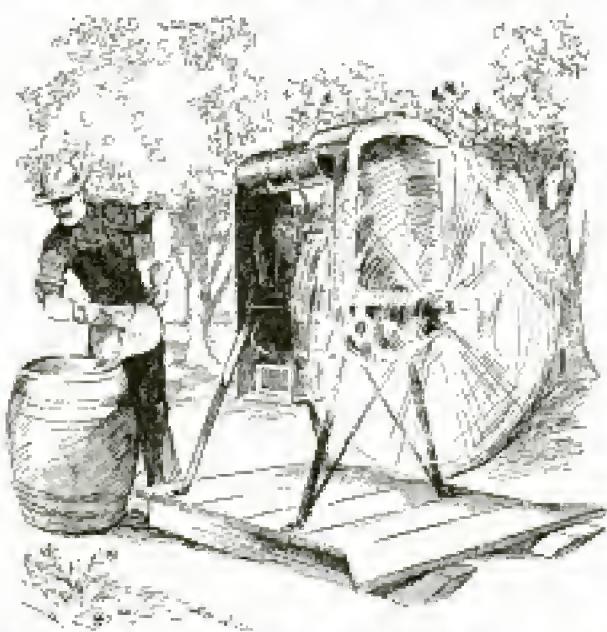


FIG. 12

FIG. 13



Propeller Prevents Frost in Orchard



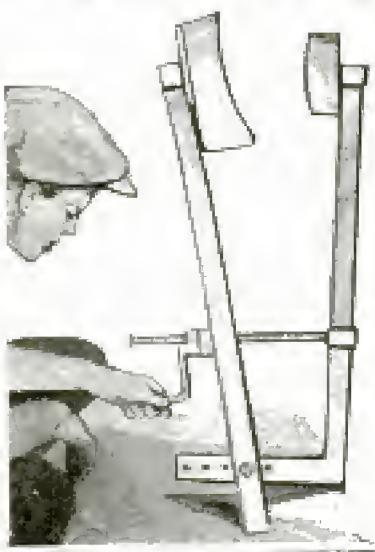
Propeller Draws Warm Air from Higher Levels Preventing Light Frost in Lower Parts of Orchard

An orchardist in Zillah, Wash., uses an old airplane propeller attached to the crankshaft of an auto engine to prevent frost from damaging his fruit during spring nights. The motor is mounted on a metal frame as shown, and set so that the propeller creates a draft of air toward the lowest parts of the orchard. In this way it draws the warmer air from the higher levels and thus prevents frost.—Stanley Wakefield, Yakima, Wash.

Clamp with Interchangeable Jaws Straightens Auto Bodies

For straightening automobile bodies, the clamp shown in the photo will be found

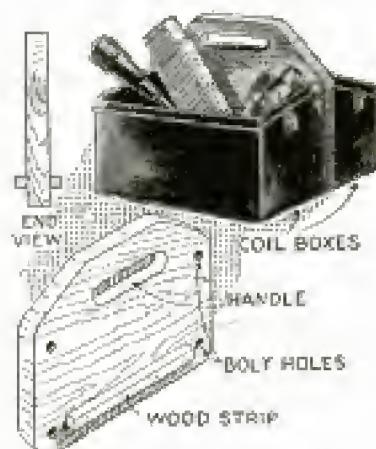
helpful in every garage, as it reaches points that are usually inaccessible by other methods. The two main members are pieces of $\frac{1}{2}$ by 2-in. steel, one being a single and the other a double bar. The former, which is 30 in.



long, is bent to 90° about 12 in. from one end and has a 1-in. square socket forged at the other. The double member is 34 in. long and is drilled for a bolt 4 in. from the end. The bolt is used to engage it with the right-angle section of the shorter piece, in which five holes have been drilled for this purpose. Wooden blocks of various shapes, fitted with square metal shanks, are made for attachment to the ends of the clamp. In use, the double member is adjusted with the bolts to make it convenient for the work, and pressure is applied with a hand crank on an 18-in. screw bar, which is inverted through the double member and is provided with a loop at the end, so that it can be slipped over the single member.

Coil Boxes Form Handy Tool Kit

Two of the boxes used for holding model-T Ford coils on the dashboard, can be screwed to a piece of 1-in. wood which is used as a separator, as shown, and will then provide a convenient tool kit. A wooden strip, nailed across the bottom, covers the open spaces of the coil box, while a slot cut near the upper edge forms a hand-hold.



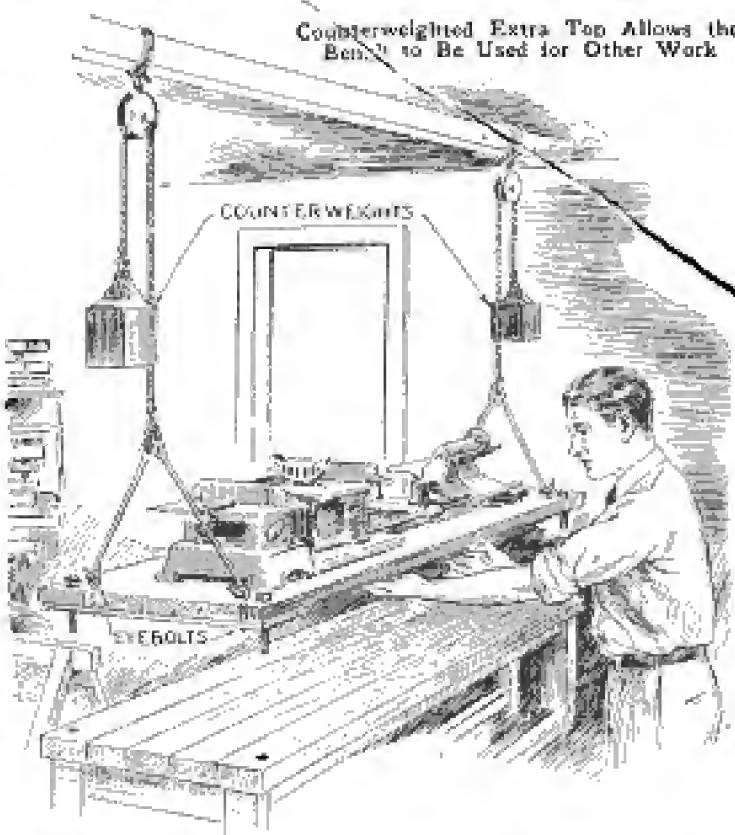
Electric Fan Substituted for Hand Blower on Forge

Many hours spent in turning the blower on a forge can be saved by substituting a 10-in. electric fan. Put it in a sheet-metal pipe that has been tapered to fit into the intake pipe on the forge. If a fan of the three-speed type is used, it will not be necessary to have a gate to control the draft, or you can employ a rheostat to control the speed.

Dirt and steel pieces on a grindstone can be removed by holding a piece of ice against it and turning it slowly.

Double Top on Your Workbench Saves Space

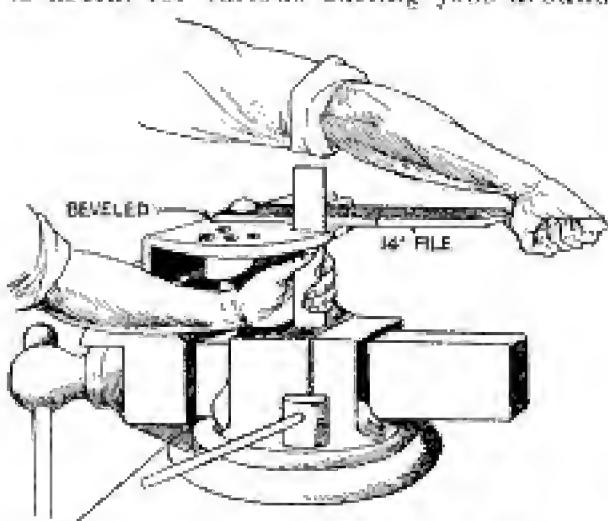
By mounting your home-workshop machines on an extra top made to fit the bench, you can save space as well as the cost of a separate bench to hold the machines. The extra top is drilled at each corner for suitable bolts with which it can be rigidly fastened to the bench. When not in use, the extra top is suspended from the ceiling directly above the bench by two ropes and counterweights, the ropes running over two pulleys fastened to the rafters or ceiling. The lower end of each rope is fastened to two iron rods, of which the ends are bent to form eyes and hooks as shown, the latter being attached to eyebolts at each end of the bench. Care should be taken in shaping these rods to see that they are of exactly the same length in order to have the top perfectly balanced to prevent tipping. When the machines are not in use, the top is easily raised, leaving the bench



free for other work.—H. Kerran, Plainwell, Mich.

This All-Purpose Shear Is Held in the Vise

Made from a heavy file and a cultivator disk, or other similar material, this shear is useful for various cutting jobs around



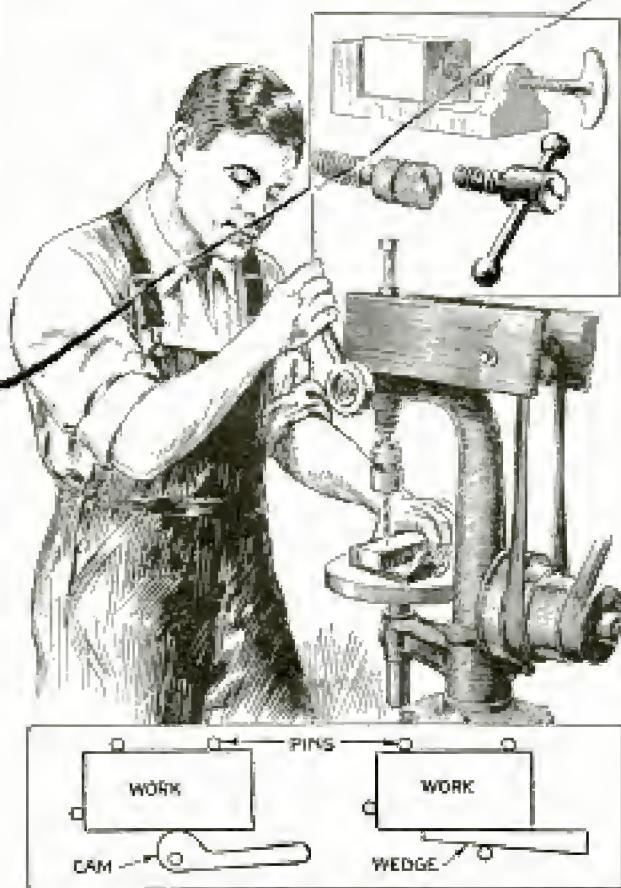
Improvised Shear Held in a Vise for Handling Light Work around the Shop or Farm

the shop or farm. One edge of the disk is bent at right angles so that it can be

clamped in a vise. The file is ground to a bevel on one side to form a cutting edge and is riveted to the disk as shown. Slots of various sizes are then cut in one portion of the disk, while holes of different diameters are drilled in the other side for cutting bolts, wire, etc. A handle on the tang completes the job.

How to Test Cylinder Lubrication

To determine whether or not an engine cylinder is being properly lubricated, run the engine for a few minutes, and then remove the cylinder head. Take four pieces of white paper and rub them horizontally over the inside surface of the cylinder. If it is being properly lubricated, there will be a considerable oil deposit left on the paper. By using this method, any deficiency of lubrication is readily detected, whether this is due to an improper grade of oil or to a faulty oiling system, either of which should be immediately corrected and another test made for verification.



Various Types of Jigs for Holding Work on Drill-Press Table Save Time in Production

Clamping Jigs Aid in Holding Work on Drill-Press Table

When doing a large quantity of work on a drill press, a clamping jig is useful, especially if it has a single screw to hold the work as shown in the upper detail. Thumbscrews or pin handles eliminate the need of a wrench. Other methods of holding work in a jig are the cam and wedge types shown in the lower detail.

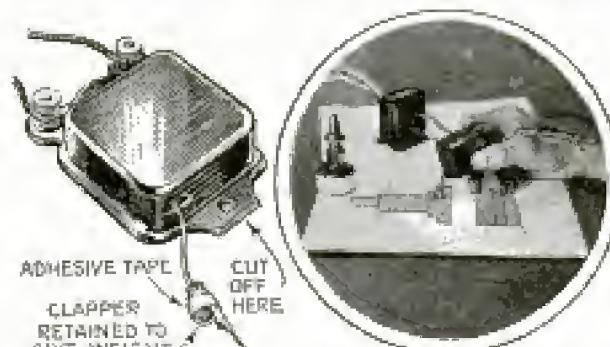
Solution for Resilvering Mirrors

Glass to be silvered for use as a mirror should be free from scratches and irregularities and cleaning of the glass should be done thoroughly and with the utmost of care to remove all traces of dirt, grime or oil. Two solutions are then made up. The first consists of 280 grams of silver nitrate dissolved in 4 oz. of distilled water. Concentrated ammonia is added to the solution until it assumes a brown color when stirred. After this, still more ammonia is added until the solution again clears up. Another batch of silver nitrate, 260 grams, is poured into the solution, which is then

stirred until the nitrate is dissolved, causing the solution to become brown the second time. More distilled water is added until it displaces exactly $\frac{1}{2}$ qt., after which it is carefully filtered and stored in a brown bottle. The second solution is made up separately, consisting of 197 grams of silver nitrate dissolved in 3 oz. of distilled water, and 197 grams of rochelle salts, the latter being added after the nitrate has been dissolved. Pour this solution in an enameled container and boil it for five minutes. When cool, add enough distilled water to displace $\frac{1}{2}$ qt., filter and store away as before. In case the solutions become cloudy, filter them just before using. The glass to be silvered is laid on a perfectly level table. For every square foot to be covered, mix together 3 oz. of each solution. After thorough stirring, the mixture is quickly poured, with a rotating motion, to cover the surface uniformly, the edges of the glass having been rubbed with paraffin to prevent the liquid from running off. The best temperature for doing the work is anywhere between 60° and 70° F. The liquid is left on the glass until the silver has been deposited, after which the glass is carefully rinsed with clear water. Allow the silver deposit to dry thoroughly and then apply a coating of shellac.

Stippling with an Electric Doorbell

For doing a large amount of stippling or spatter work in a short time, this device, which consists of a doorbell, with the gong removed and a pen fastened to the clapper, will be found useful. Held in the position shown, the rapidly vibrating clapper



Spatter Work Done Quickly and Uniformly with Pen Fastened to an Electric Doorbell

enables you to do stippling quickly and uniformly. The bell is connected to a 6-volt transformer or to three dry cells.

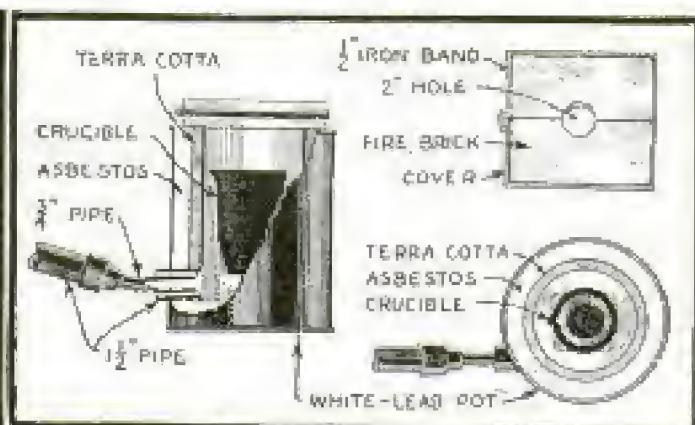
CASTING BRONZES *in* the HOME WORK SHOP

By R. E. EDWARDS

SMALL bronze castings, such as statuettes, book ends, nameplates, decorative doorknobs, and other small art objects, can be made at home by a person of average skill, provided the subject attempted is not too complicated. Simple articles can be modeled in wax, as shown in the upper detail of the illustration, using a hot wire for working the wax to shape. The wax cast should also have a stem attached which forms a sprue, or hole, for pouring in the molten metal. When the cast is completed, it is covered with a paste made by dissolving asbestos in water. Next, plaster of paris is applied around the asbestos covering to strengthen it, after which the wax cast is steamed out. The mold is then thoroughly dried in a kiln consisting of a few bricks cemented together with fire clay and heated slowly over a small gas plate. The mold can also be dried in an oven, but it must be remembered that the drying process should be very slow and thorough. The mold is then packed in sand so that, if it should break, the molten metal will not run out over the floor.

If you desire to model objects in plaster instead of wax, the same procedure is followed with slight variations. After the plaster cast has been finished, a temporary glue mold is made by pouring a good grade of flake glue around the cast, which must be well oiled so that the glue will not stick. When hard, the glue is cut around the periphery in the least possible number of pieces necessary for its removal. As the glue





is slightly flexible, two or three cuts will usually suffice. The pieces are then reassembled, fresh glue being applied over the joints. Melted wax is poured into the glue mold, and when the wax is hard, the mold is removed. In making large casts, it is advisable to use a core made by mixing asbestos paste with a little sand and molasses water. It is pared down to size with a sharp knife so that it will be about $\frac{1}{8}$ in. smaller than the finished mold, thus providing space for the metal between the two. The core is attached to a wooden base, and the glue mold is then set up around it, after which the wax is poured. A number of nails are driven through the wax layer so that their heads anchor in the asbestos mold, which is applied after the glue mold has been removed. To further strengthen the mold, wrap it in a few turns of soft wire and apply plaster of paris. During the course of these operations, be sure to leave a sprue. Melting out the wax is the last step preparatory to filling the mold with molten metal.

A suitable bronze, which gives a pleasing color, consists of copper about 85 per cent, tin, 14 per cent, and zinc, 1 per cent,

by weight. A furnace for making the melts can be quickly improvised from an old white-lead can burned clean, and a piece of terra-cotta pipe of such size that a 2-in. space will be left between it and the side of the can, which is packed with asbestos. A hole is drilled through both walls, about $1\frac{1}{2}$ in. above the bottom, for a $\frac{3}{4}$ -in. pipe, which is bent on the inside to direct the flame slightly upward. Ordinary illuminating gas is used for fuel, and an air blast is obtained by using an old vacuum-cleaner blower. A crucible, or container in which the metal is melted, stands on a piece of fire brick in the center of the furnace. The flame curls around it and enables melts to be made in a short time. A handful of granulated charcoal is thrown into the crucible from time to time while the metal is being heated, to reduce oxidation. After the copper has been melted add the tin. Stir vigorously with an iron rod and, if the alloy volatilizes to an appreciable extent, the heat should be reduced until it ceases. When the tin has alloyed with the copper, turn off the gas and air, and add the zinc. Stir constantly to avoid possible loss of zinc. Also be sure to keep the window open to let out the fumes produced. When the alloying is complete, the cover of the furnace, a fire brick, is taken off, the crucible is grasped with a pair of tongs and lifted out of the furnace carefully but as quickly as possible, and the metal is poured into the mold. After this is done, the crucible is set back in the furnace and the cover replaced, as the crucible is less likely to crack when cooled slowly. Crucibles of the black-lead or graphite type can often be purchased at hardware dealers or can be obtained from chemical or foundry-supply houses.

When the metal in the mold has cooled, the latter is broken away, the sprue cut off, and the bronze casting is given an acid bath to loosen parts of the mold that may be burned onto the metal. This bath is a solution of nitric acid, 1 part, and water, 10 parts, the acid being poured slowly into the water. Holes in the casting are plugged up with pieces of the sprue, and high spots may be worked down with a file. If a verdigris finish is desired, the bronze is heated and painted with a copper-sulphate solution, the process of painting and heating being repeated until the desired color is obtained.

Holding Sheep While Shearing

If difficulty is experienced in holding a sheep while shearing it, set it upon its rump and fasten its hind legs together by slipping a small rope over them, tying it in one knot. Then force one front leg down between the hind legs and below the knot and tie it in this position. The animal will remain quiet until sheared, and the fleece will be kept intact so that it can easily be bundled.—P. H. Ashby, Edmonton, Alberta, Can.

Steel Band Protects Mower Wheels



in the photo. Holes are drilled through both the wheel rims and the extra rims for bolts, which are slipped through from the outside.

Large spikes can be driven into concrete by first forcing them through a piece of 2 by 4-in. stock, which is then split away, and the nail is driven in the rest of the way.



Unusual Type of Ladder with Hinged Rungs Offers Wide Range of Use on Roofs

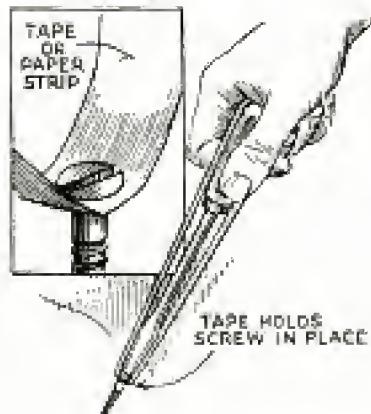
Collapsible Ladder for Working on Roofs

Consisting of two rails fitted with foot-holds, and three rungs, which are hinged in the center, this ladder is useful when working on roofs. The hinges allow the ladder to be placed over the ridge of the roof, while hooks fastened to the end of the rails serve to hang it to the ridge for working in the valleys as shown.—Jesse L. Blickenstaff, N. Manchester, Ind.

Driving Screws in Narrow Places

Driving screws in places where it is ordinarily impossible to support them in the desired position, becomes easy with the use of a strip of paper or tape as shown. The screw is inserted through the center of the strip, and the ends of the tape are pulled taut

against the sides of the screwdriver handle. Held so, the screw can be started at almost any angle, and the strip is torn away after the screw has caught hold.



Electrically Heated Brooder in Store Displays Baby Chicks



Electric Lamps Mounted in Pens Built along Store Wall Keep Baby Chicks Warm

For displaying baby chicks in a store, a simple brooder can be made by building wooden pens along one wall. A board, nailed across the back of the pens, holds electric lamps that furnish heat. Lamps of various sizes may be used, depending on the amount of heat required, and two-way sockets may even be provided for two lamps in each pen, although one lamp is usually sufficient.—George R. Harrison, Council Bluffs, Iowa.

Trees and Shrubbery Protected against Rodents

Sulphonated oil is recommended by the University of Minnesota as an effective protection for trees and shrubbery against rabbits and mice. Preparation of the repellent is as follows: Heat 1 qt. of either raw or boiled linseed oil until it reaches 470° F. A blowtorch will provide suffi-

cient heat, and the heating should be done outdoors where there will be no danger of fire if the oil boils over. Use a container that will hold about five times the quantity of oil when the latter is cold. Upon removing the oil from the fire, add finely powdered flowers of sulphate, a teaspoonful at a time until 3 oz. of sulphate has been added, stirring each spoonful well into the oil. When this is done, the oil will become hotter, foam badly and give off an obnoxious odor. When cool, the mixture is applied to tree trunks and branches.

Wire Reel Fitted on Tool Kit

Electricians and linemen will find the addition of the illustrated reel to their tool kit convenient, as it keeps the wire handy and prevents it from tangling. A detachable crank may be provided for winding up the wire, the crank being kept in the tool kit.—Ray Blain, Fort Hayes, Columbus, Ohio.



Turning Balls in the Lathe

In turning a quantity of 6-in. brass balls in the lathe, a jig to do this work quickly and accurately was improvised as follows: A piece of old casting, having narrow flanges on it similar to a short piece



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of heavy channel iron, was used as a base for holding a turntable and was bolted to the lathe carriage. The turntable, which held the cutting tool, was fitted at the exact center under the lathe spindle so that the tool would travel in a true circle. Attached to the bottom of the turntable was a 6-in. gear engaging with a worm that was held on a shaft driven from a pulley on the cross-feed screw. By this arrangement it was possible to make the cutting tool travel slowly in an arc, although it was also possible to move the turntable by hand with a crank. When turning it by hand, the round belt was allowed to slip on the driving pulley. This method of turning pulleys can be applied to almost any lathe, the details of construction being varied to suit different conditions. The jig is easily made and can be employed for spherical turning up to 8 in. in diameter. Satisfactory worms and gears can usually be picked up at almost any junk yard, and the pulley can be made of any kind of metal, or even of hardwood. Instead of mounting the toolpost in a slide, adjustments are made by sliding the cutting tool back and forth in the post and clamping it wherever desired.—A. E. Granville, Knox, Ind.

Emergency Goggles Quickly Made

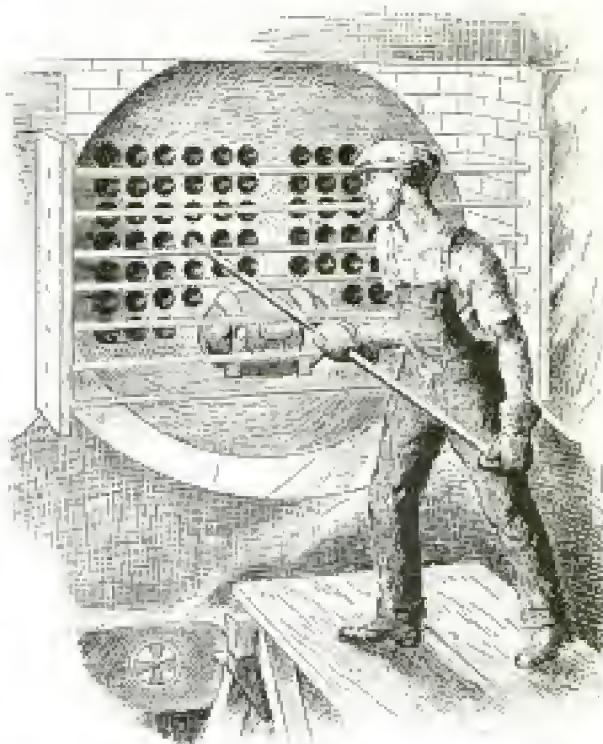
Cut from a piece of celluloid, a pair of emergency goggles can be made to protect the eyes.

In cutting the celluloid, leave a T-shaped projection on each end as shown, to which a string is fastened.



Using Short Ends of Welding Rod

Short ends of electric welding rods may be utilized in the following way: Take two flat pieces of carbon and bolt them together in metal frames, drilling small holes in the tops, about halfway down to receive the electrodes. When the welding rod is worn too short for use, insert a new rod in a small hole in the carbons and weld it to a short end.



Pipe Support Hooks onto Fire Doors and Acts as Guide for End of Long Flue Cleaners

Support for Heavy Flue Cleaners

When using a long, heavy flue cleaner in a large boiler, the illustrated support will prevent the rod from swaying and will serve as a rest for the end of the cleaner when changing from one flue to another. Suitable lengths of pipe are snugly fitted into holes drilled through two 2 by 4-in. pieces, which are provided with hooks for hanging the support on the fire doors.

Nut Prevents Punch Breakage

Slipped over the end of a punch as shown, a nut provides a means of prying it loose should it become stuck in the hole when punching out rivets. By using a suitable tool under the nut as a lever, you can loosen the punch with a straight upward jerk without breaking it.



Curing Electrical Troubles

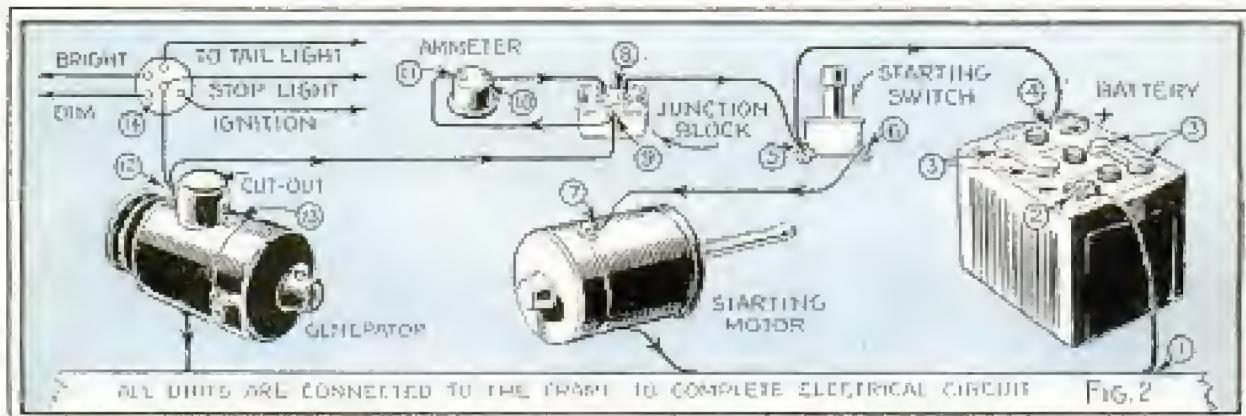


BESIDES knowing simple roadside tests in order to locate troubles and making quick emergency repairs, you can usually avoid unexpected electrical trouble in your car by observing various warning signals.

When the lights flare up abnormally bright, the voltage in the circuit is too high, and this will cause them to burn out too soon. Producing this extra voltage overheats the generator and may burn it out if the car is driven fast for a few hours. Other results are burned breaker points and an overloaded condenser and ignition coil. Resistance to the flow of current in the circuit, such as loose and corroded terminals at points 1, 2, 3, 4, 5, 8, 9, 10 and 11 of Fig. 2, causes the generator voltage to rise in an attempt to overcome this resistance. The battery ca-

ble, if not well soldered into the terminal, sometimes is the offender, although occasionally poor contact is found where cell connectors are fastened to the cell posts, as at point 3. A quick test for loose connections at these points is to run the starter for about 30 seconds, which will cause loose connections to become warm. These should be removed, cleaned and replaced so that they are absolutely tight. Resoldering is sometimes necessary.

If the battery mysteriously runs down, a ground, either permanent or intermittent, is usually responsible. To check for such a condition, remove one of the battery cables and connect a 6-volt lamp or voltmeter between the cable and battery terminal, as in the lower detail of Fig. 13.



in Your Car

By C.E.Packer

Member
Society of
Automotive
Engineers

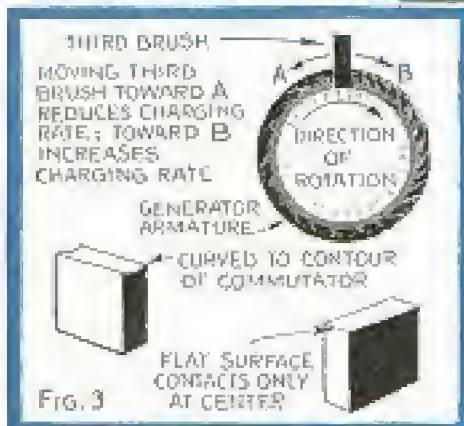
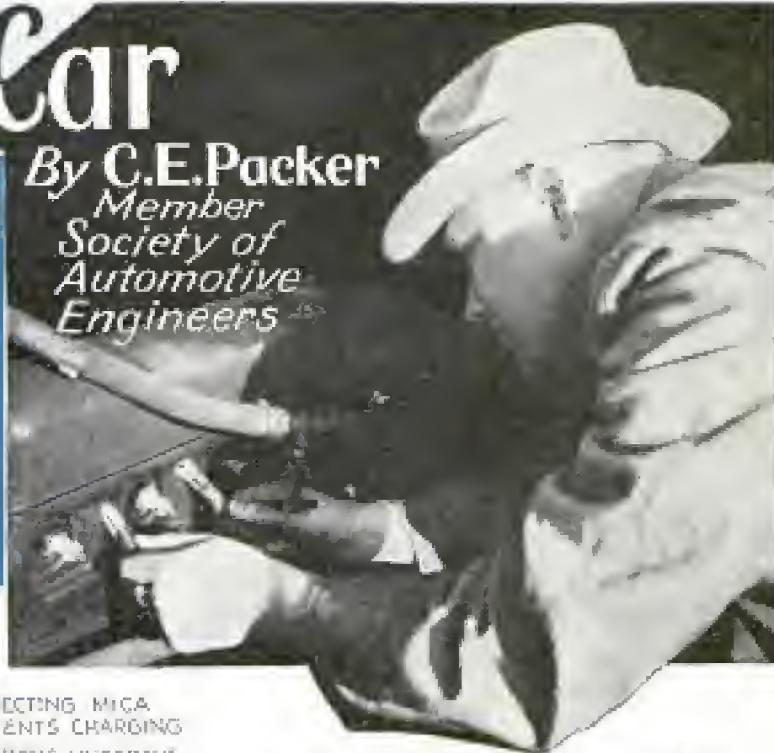


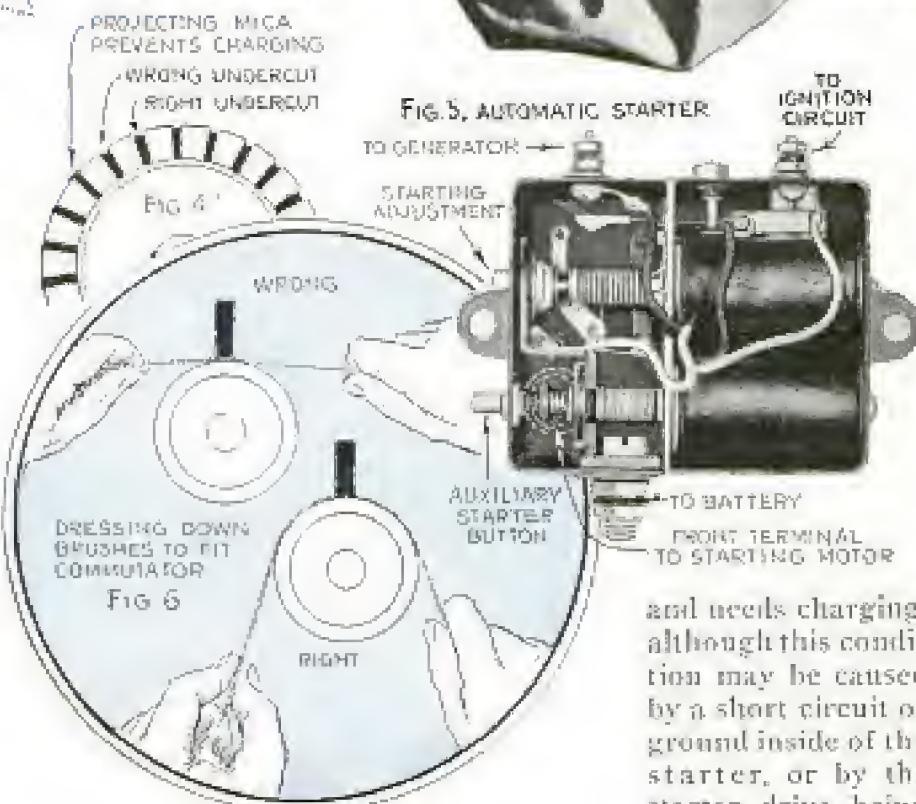
Fig. 3

HACKSAW BLADE
TAPED



With all switches turned off, no current should flow, and the lamp should not light. Move all electrical wires from side to side until the lamp flickers. When this happens you have found the ground—usually a bare or chafed spot on the wiring which must be protected with tape. A voltmeter is substituted for the lamp where a high-resistance ground is suspected, as it will indicate a minute flow of current that will not light the lamp. An instance of a high-resistance ground is a bare wire inside of the armored cable, which does not touch the frame of the car for quite a distance from the point where the wire is grounded. The lamp or voltmeter method of testing, with the switch off as just described, does not apply to the wiring between the switch and lights.

If the lights almost go out when the starter is used, the battery is run down



and needs charging, although this condition may be caused by a short circuit or ground inside of the starter, or by the starter drive being jammed. The latter condition can generally be corrected by putting the car in high gear and rocking it back and forth. If the starter does not turn and the lights go out when the starter circuit is closed, but go on again as soon as the starter switch is released, there is poor contact at some point such as 1, 2, 3, 4 or 5, Fig. 2. If closing the starter circuit makes no difference in the lights, and the starter does not turn, there may be a

FIG. 7. GAP BETWEEN ARM AND CAP NOT OVER .025"



poor contact in the starter switch, or the starter brushes may be making poor contact with the commutator. The brushes should be under a spring pressure of 18 to 20 oz., which may be tested with a small scale, as shown in Fig. 9. On cars equipped with an automatic switch, which closes the circuit when the ignition is turned on, a defect in this unit would also cause failure in starting. In this case, the auxiliary starting button on the side of the unit, as shown in Fig. 5, is used. When the generator does not function, the trouble may be traced to stuck or dirty brushes, or the mica separating the commutator segments may project too far and must be undercut. In the latter condition, the brushes ride on the mica and do not come in contact with the commutator. The remedy is to undercut the mica as in Fig. 4, using a short piece of hacksaw blade. If the commutator is grooved, it should be turned down in the lathe. If you are using several electrical devices resulting in excessive current consumption, which runs the battery down faster than it is charged, the charging rate of the generator should be increased by moving the third or thin brush as indicated in Fig. 3.

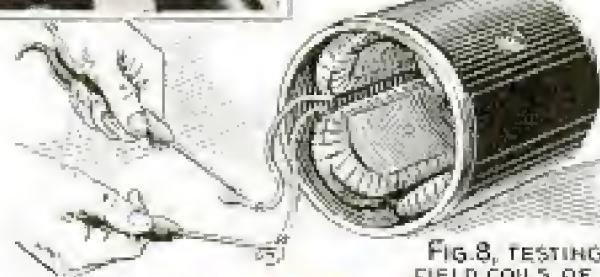


FIG. 8. TESTING FIELD COILS OF GENERATOR

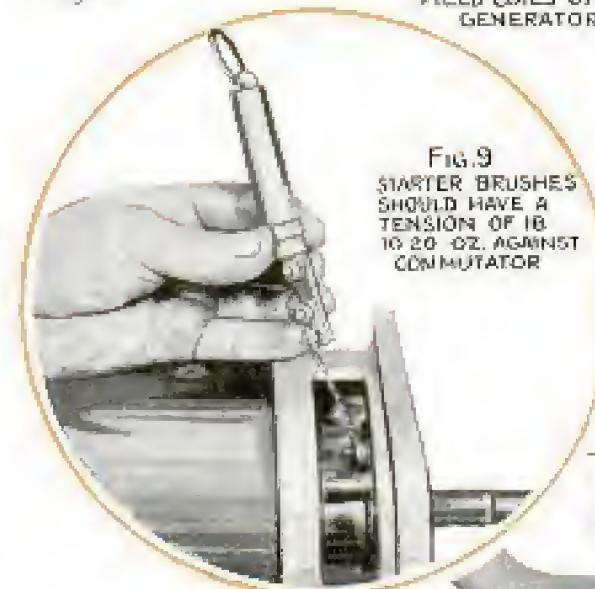


FIG. 9
STARTER BRUSHES
SHOULD HAVE A
TENSION OF 18
TO 20 OZ. AGAINST
COMMUTATOR

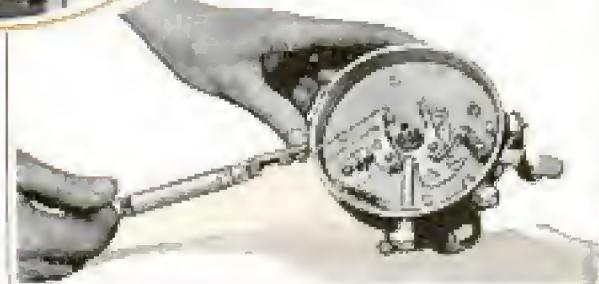


FIG. 10. BREAKER POINTS
OPEN .020 TO .022"
SPRING TENSION 18 TO 20 OZ.

A high-speed miss may result from the gaps being too wide. Spark plugs should all be set alike with a gap of from .024 to .028 in., using a feeler gauge as in Fig. 1. Plug insulation can be tested by sliding a piece of mica between the points while the plug is sparking. If this causes a spark inside of the shell, the insulation is faulty, perhaps due to carbon deposits, and the plug should be thoroughly cleaned or re-

An increase in the charging rate may be necessary to compensate for the increased use of the starter and lights during winter months, while the reverse holds true during the summer months, requiring a readjustment of the brush to decrease the charging rate. Brushes should be sanded to fit the surface of the commutator by the method shown in Fig. 6, to obtain maximum contact. Brushes that have flat ends will contact only at the center. If, upon reassembling the generator, you still obtain no current, there may be an open circuit or ground in either the field coil or armature. To test for this condition, see Figs. 8 and 12, the open-circuit test being illustrated. Touching one test point to the shaft or frame will check for a ground.

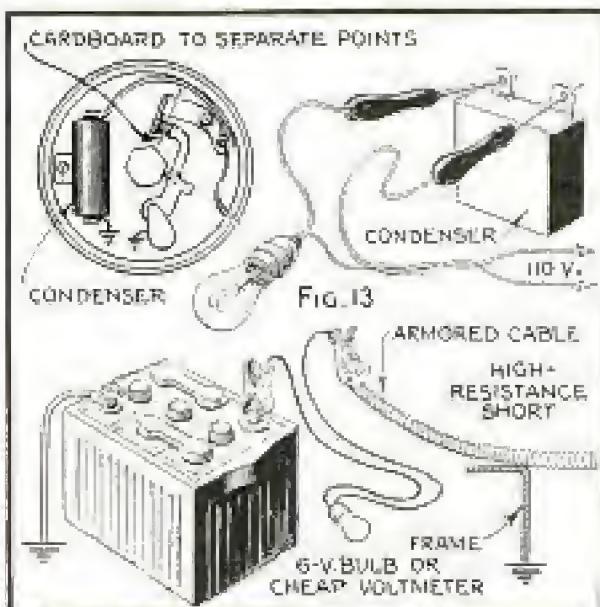
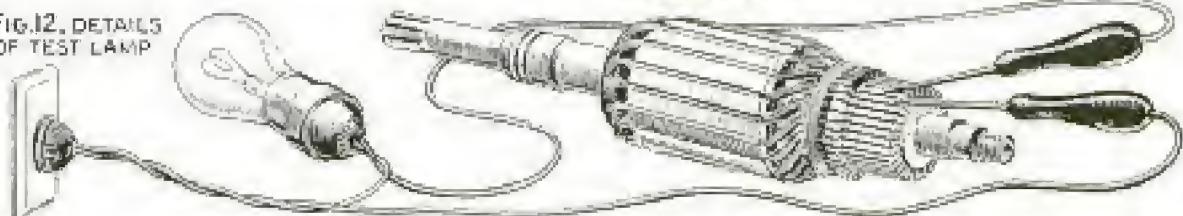
When a motor misses at low speed, spark-plug gaps are perhaps too close.

newed. It is recommended that spark plugs be renewed every 10,000 miles. If, with the ignition switch turned on, the ammeter shows a steady discharge of about 5 amp., it means that the breaker points are not opening, the insulated point grounded, or the wire from the coil to the breaker grounded. A zero reading on the ammeter indicates a break in the wiring to the primary terminal of the coil, an open primary winding inside of the coil, poor contact in the ignition switch or in the breaker points, so that they do not touch or are too burned and dirty to conduct current. The normal reading, with the ignition switch on, should be 1 or 2 amp. If this condition exists but there is still no spark, the coil may be internally short-circuited, the condenser open, or



FIG. 11

FIG. 12. DETAILS OF TEST LAMP

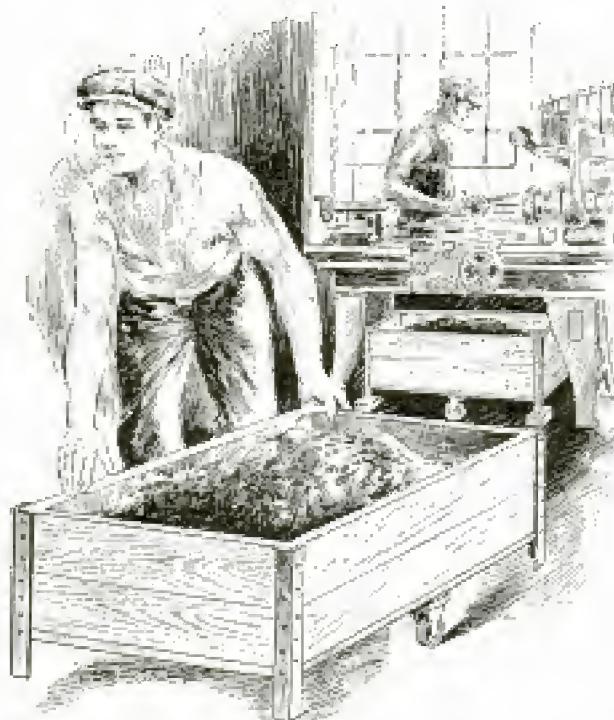


the high-tension current may be leaking from the distributor arm to the distributor shaft. To check for leakage in insulation through the high-tension wires, place the car in a dark place and turn the engine over with the ignition on. Leakage can then be both seen and heard. Breaker points of the distributor should be adjusted as shown in Fig. 10. The gap between the distributor arm and cap contacts

should never exceed .025 in., as in Fig. 7. Too large a gap will overload the coil and the high-tension wiring.

If a current of 4 or 5 amp. flows through the primary winding of the ignition coil when 6 volts is used, as in Fig. 11, the primary is probably all right. The secondary winding can be tested by means of a 110-volt lamp, as in Fig. 11. A faint glow of the lamp indicates that the winding is in good condition. Total absence of light indicates a break. If the lamp burns brightly, there is an internal short circuit. A new coil is the only remedy.

To test a condenser on the road, place a piece of cardboard between the breaker points as in the upper detail of Fig. 13. Then, with the ignition turned on, no current should flow. Condensers are connected across the breaker points and, if the current does flow, the condenser has an internal short circuit, assuming that the moving contact on the breaker is not grounded. If 110-volt current is available, a test as in Fig. 13 can be made. The lamp should not light if the condenser is in good condition, but if the lamp lights, there is a direct short circuit inside the condenser, which means replacement.



Box for Lathe Cuttings Is Fitted with Casters to Permit Quick Removal

Removal of Lathe Cuttings Simplified with Wheeled Box

Lathe cuttings are easily removed by using this wheeled box. Two large casters are mounted near each edge at the center, and the corners are fitted with angle irons, extending a little below the bottom to serve as legs. In use, the box is set under the lathe, and small blocks put under two end legs to hold it level.

Corner Ornaments Cut with Router

Internal-corner decorations on cabinet-work can be made with a router as shown in the photo. First lay out the work on the corner pieces and then route out the decorations. In this case, two cuts with the router were necessary to make the finished piece. After the first cut was made, the



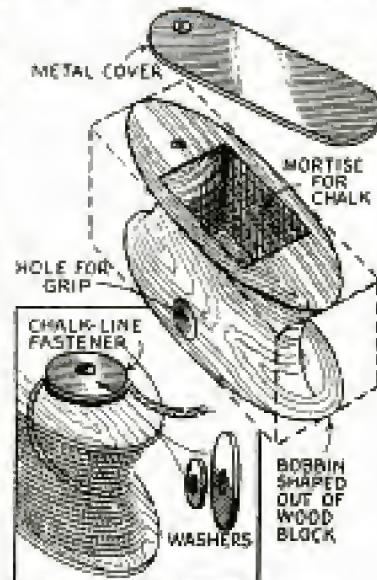
stock was turned end for end to do the other cut.—John E. Hyler, Peoria, Ill.

Sandpapering Helps Make Cams Work on Linotype Machine

When the cams on a linotype machine fail to turn over sufficiently to release the mat, take a small piece of No. 00 sandpaper, and hold the paper lightly against the roller a few seconds while it turns. Then touch the keys and see how readily the cam and mat respond. Of course, this will not always remedy the trouble, but has been found effective in many cases.—Fred Sutton, Versailles, Mo.

Mortise in Chalk-Line Bobbin Holds Chalk

Carved from a wood block to the shape shown, this bobbin has a mortise cut out to hold the chalk, and a pivoted cover to keep it in place. A fastener to hold the line at any point, or to hold the end when the line is not in use, is made by screwing two washers to one side as shown in the lower detail. It will also be found helpful to countersink two holes on the back edge as a grip for the thumb and forefinger when the line is being unwound.—A. A. Richardson, Chico, California.



Traps for Insect Pests

Crawling insects, such as ants, can be killed by sinking small glasses or cups level with the ground and half filling them with milk and water. The insects will fall into the cups and drown. Slugs can be caught by inverting grape-fruit and orange skins on the ground. The slugs will crawl under these at dawn and can then be caught and destroyed.

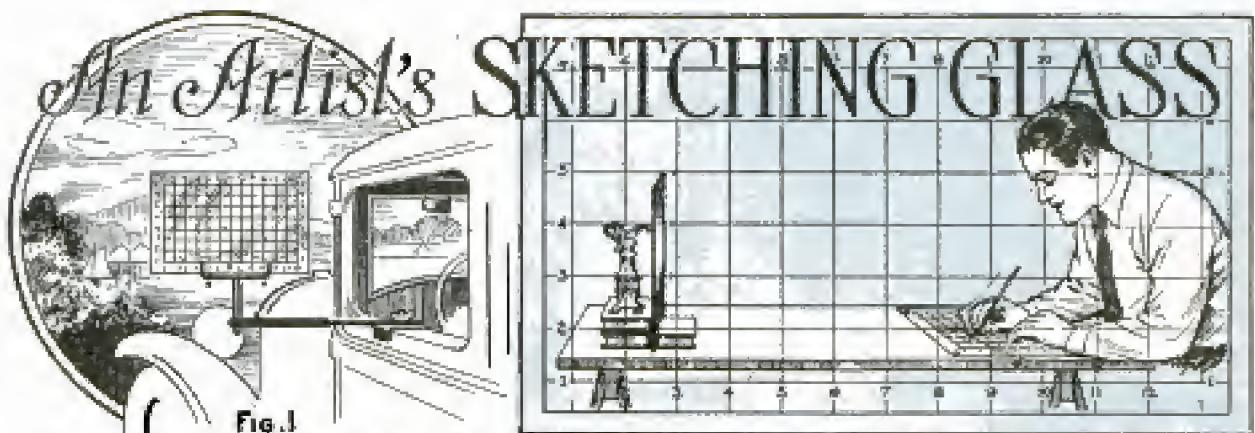


Fig. 1

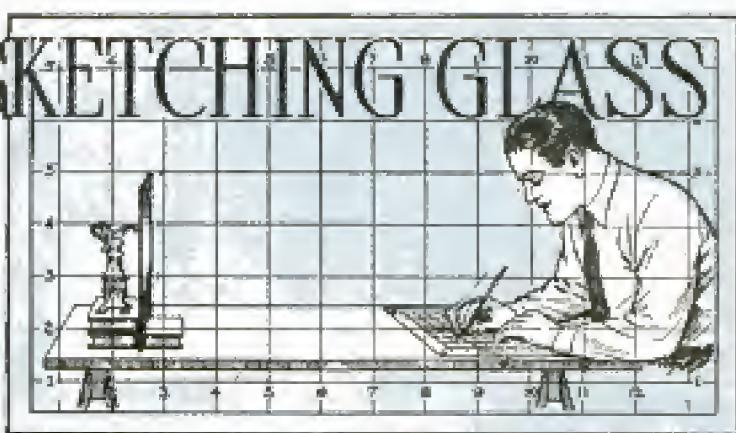


Fig. 2

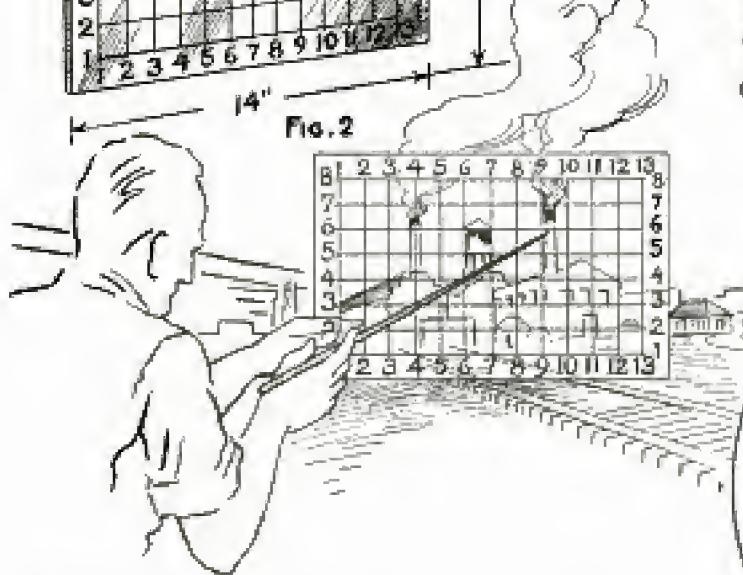


Fig. 3

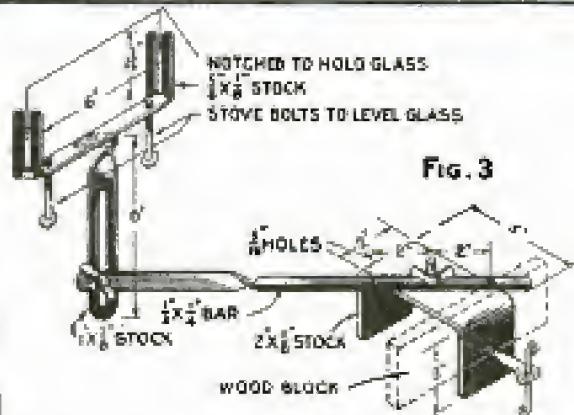


Fig. 4

ANYONE can make landscape sketches by copying the scene through a piece of plate glass ruled off in 1-in. squares, numbered both horizontally and vertically. The sketching paper is similarly ruled. The lines on the glass may be scratched with a glass cutter, and then filled with India ink. It is essential that the artist maintain his exact position about 20 in. directly behind the glass. For table use, shown in the upper right-hand detail, a slotted block forms a good holder. Figs. 1 and 3 show a holder adapted for use on an automobile. A wide range of adjustment is possible, and the holder is securely attached to the edge of the car door by means of a clamp, a wooden block being used to prevent marring the finish. For

field work without a car, a holder can be made along the same general lines, but in this case it is fitted with a 40-in. rod, the pointed end of which is driven into the earth as shown in Fig. 4.—Charles W. Owens, Hermitage, La.

Linseed oil brushed on a window sash before applying putty will make it adhere more firmly; you will also find that, by mixing white lead with the putty in a proportion of one part of white lead to five parts of putty, the stuff will dry harder.

Portable Scale Aids Inventory



Low Truck Mounted on Casters Carries Scale About for Convenience in Taking Inventory

In hardware stores, plumbing shops and similar establishments where inventory of stock calls for the weighing of many articles, it is much handier to move the scale from place to place than it is to carry the articles back and forth between the bins and scale. One hardware dealer uses a simple truck mounted on casters for moving his scale about, and has found that it is not only practical but saves much time as well.

Sponge Rubber to Quiet Power Tools

Sponge rubber of the kind used for kneeling mats, cut in pieces of suitable size, and placed under the base of small power machines, will absorb most of the vibration and noise. Also, the use of sponge rubber eliminates the tendency of many small machines to "walk." The sponge can be attached to the base with rubber cement, which is applied to both contacting surfaces and allowed to dry before pressing them together. If it is necessary to bolt a machine down, drill holes twice the size of the bolts to be used. Then place sponge-rubber washers under large metal washers on the base before inserting the bolts, and use sponge rubber cushions between the machine base and

the bench top. The nuts on the bolts should be drawn just tight enough to hold the machine in place, but not so tight as to crush the rubber.

Effective Paint and Varnish Remover

A very effective preparation for removing paint and varnish may be made by mixing equal parts of amyl acetate, acetone and benzol. Amyl acetate is commonly sold under the name of banana oil. All three of these constituents are readily obtainable from any drug or paint store. To use the remover, apply it with a rubber-set brush or cloth swab. After the work has stood for a few minutes, the paint or varnish may be wiped off with a rag. Although this mixture is not seriously dangerous to the hands, it is best to wear gloves to prevent that dried-out feeling which results when the oil from the skin has been dissolved. Like other paint removers, this compound is inflammable and hence should not be used near an open flame.

Book-Display Rack for Store Window

A western book dealer finds it a great convenience to lay the books in his window display on boards, as shown, so that any one of them can be removed and replaced without much trouble. To set the boards at an angle, a low horse is used at one end. For the sake of appearance, the boards are covered with crepe paper, while cleats cut from light molding, spaced at regular intervals, are attached to hold the books in place.



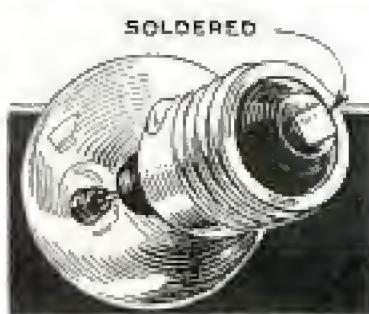
Books on Individual Racks Set in Bookstore Window Are Easily Removed and Replaced

Printing Badges on Cloth Ribbon

On a job of printing ribbon badges, the following method was improvised and used with success: A wooden reel was mounted on a spindle so that the ribbon could be pulled up over the press table, a double row of guides keeping it in the correct position for printing. After each impression, the ribbon was pulled up for the next, and when the entire spool had been run through the press, the ribbon was rewound and the badges cut off with a pair of shears as needed.—Lester P. Young, Culver, Ind.

How to Preserve the Efficiency of Tungar Bulbs

In battery chargers where tungar bulbs are set horizontally, the charging current is reduced after a few months of use, because the effective plate area has become smaller than it was originally, due to sagging down of the filament. A good method of remedying this trouble is to turn the bulb halfway around, so that the filament will slowly return to its normal position.



This it will do after repeated heating. In order to insure good electrical contact between the tip of the bulb and the socket, after the bulb has been

turned halfway around, a small piece of metal, the thickness of which should equal just half the pitch of the threads, is soldered to the tip as shown. When the filament again sags beyond the center of the plate in the opposite direction, the condition can be corrected by removing the soldered piece on the tip and screwing the bulb into the socket in its original position.

QBefore attempting to cut a thread in a piece of wood, apply beeswax to it and heat so that the wax soaks into the wood, but without scorching it.



Oil Rack for Service Station Runs Correct Amount of Oil into Crankcase While Attendant Fills Gasoline Tank

Oil Rack Saves Time of Service Station Attendant

Much time can be saved at service stations by using this oil rack. It holds a large number of oil containers and is fitted at the top with four funnels, which empty into a flexible hose. In use, the bottles of oil are set in an inverted position in the funnels, allowing several to drain at once so that the attendant can serve another patron in the meantime.

Wrench Improvised from Two Nuts and a Bolt

A Kansas City man was in need of an adjustable wrench, but was unable to locate one. After a little consideration he made the emergency wrench shown, by running two square nuts on the threaded end of a bolt and adjusting them to fit the nut.—Neil Nelson, Kansas City, Mo.



Q 227

Can You Solve these Puzzles?

By
SAM LOYD / 53



"THIS year's income," said the president, "will pay $6\frac{1}{4}$ per cent on the company's entire stock, but as we must pay 7 per cent on \$7,600,000 of preferred shares, we can only pay $5\frac{3}{4}$ per cent on the common stock." What was the company's net income?

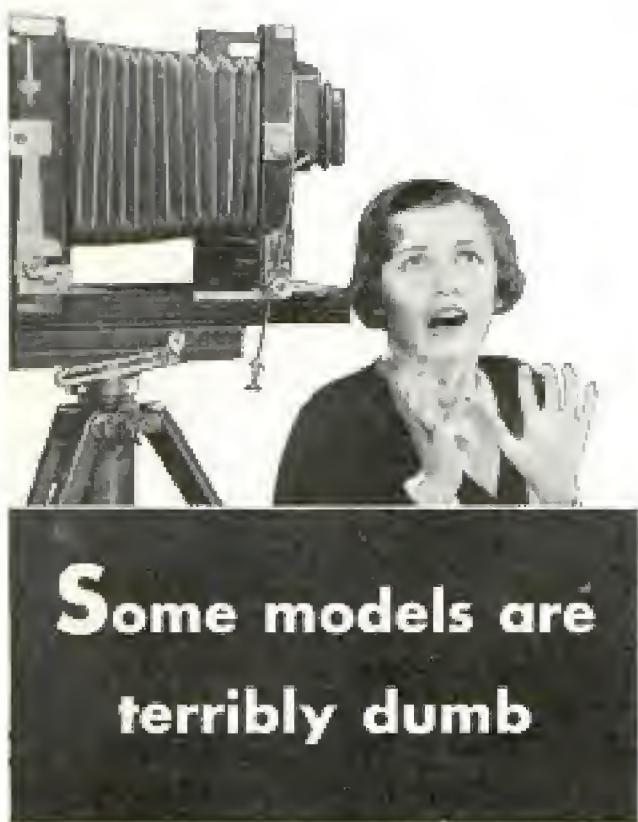
A FARMER purchased a horse for \$42, and after keeping it for a while, resold it for \$75. That looked like profitable business, yet he lost one-sixth of the purchase price plus one-fifth of the cost of feeding the horse. How much did he lose on the deal?

Answers to Last Month's Puzzles

In the motor-bus puzzle, the mileage between towns has no bearing on solution. The two elements to be considered are time and distance. You know that the time of both busses from their starting points to the meeting is the same. The distances on the opposite sides of the passing point are unknown, but in each case they are the same for both busses. Therefore we have on one side a comparison of a certain distance with one hour's time, and on the other, a comparison of a certain distance with four hours' time. This enables you to set up simple ratio problems, as follows: The distance traveled by one bus is to 1 hour as 4 hours is to that

of the bus traveling in the opposite direction. The time in both cases is equal, so you can call both X and you have your ratio $X:1=4:X$; this makes $X^2=4$ or $X=2$. In other words, both busses covered the distance to the meeting place in two hours, but one bus took six hours for the whole trip, while the other took only three, and therefore was twice as fast.

To solve the link problem, first cut and take out every sixth link, thus producing five five-link pieces for 50 cents. Since a new five-link piece costs only 25 cents, the sixth required piece is bought rather than soldering the five cut links. Thus the total cost is only 75 cents.



Some models are terribly dumb

"We were talking about his beard when he stepped into the room. I'm afraid he overheard us. Anyway an awkward silence followed." This, briefly, was the story told us by a young woman a few days ago. The yarn intrigued us, so we decided to re-enact the scene before the camera and present it to our audience. But it was a really harrowing experience. Just try and get a good photograph of an embarrassed silence! So we decided to show you the picture in the making—and here it is.

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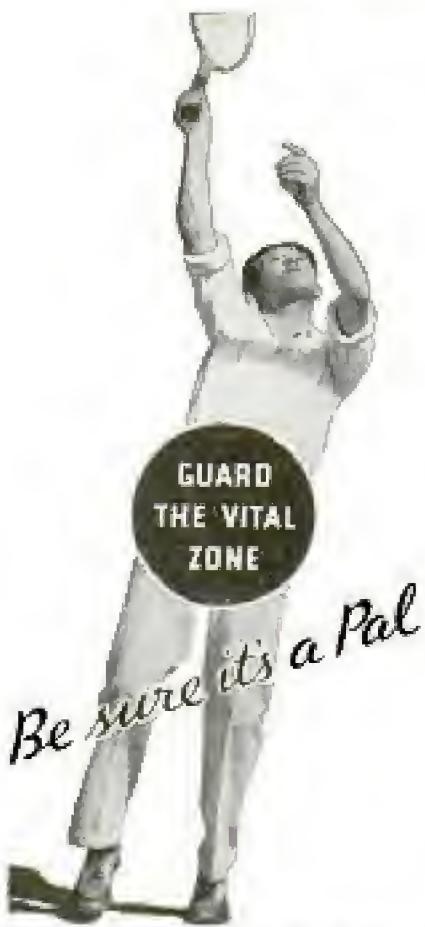


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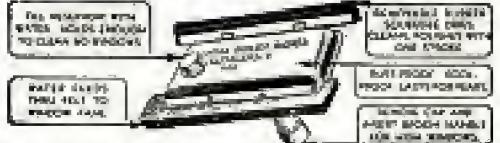
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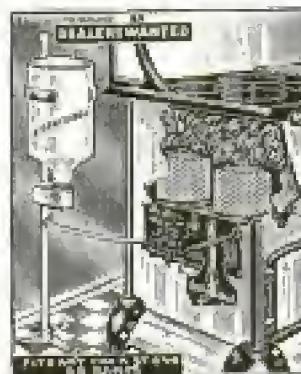


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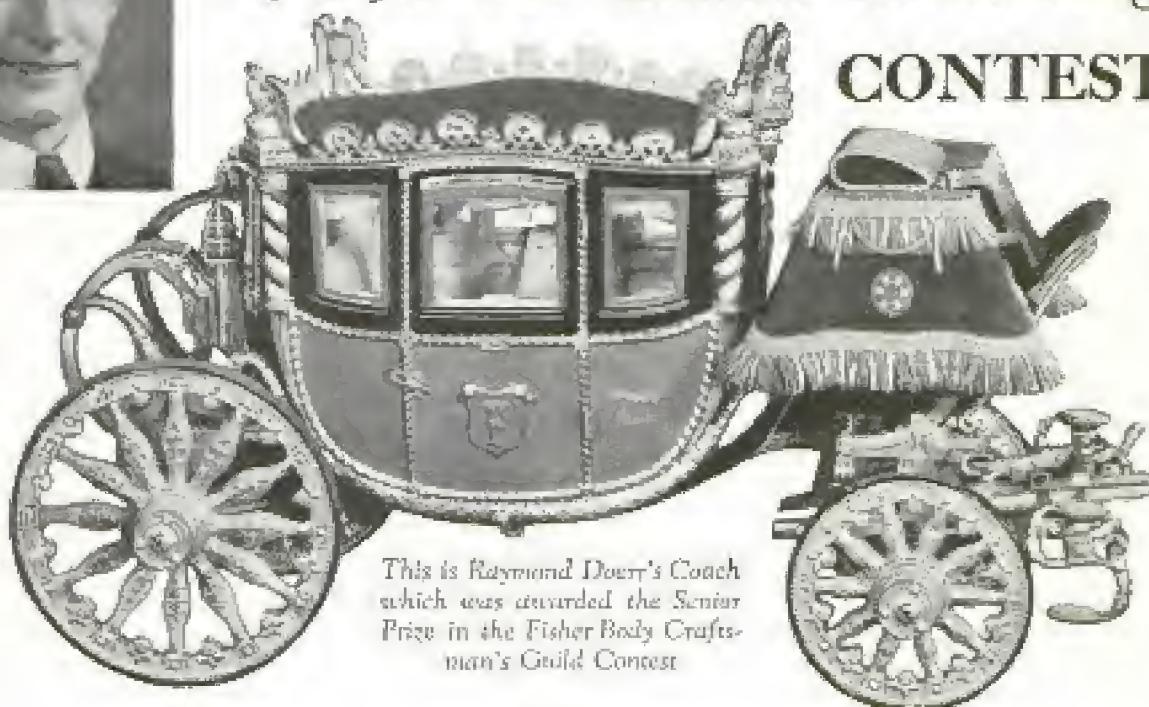
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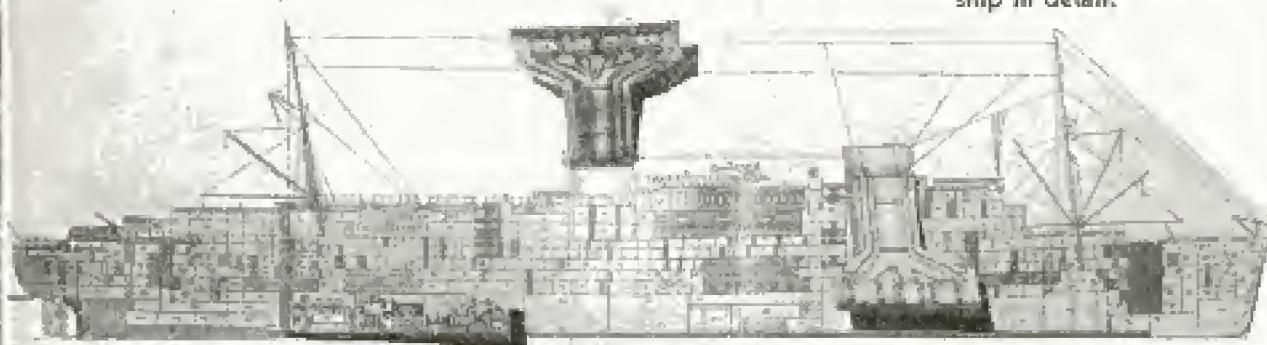
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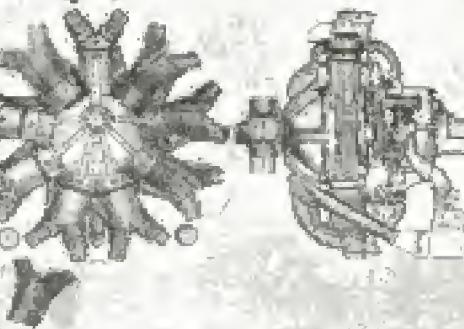
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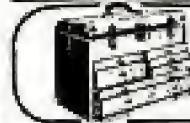
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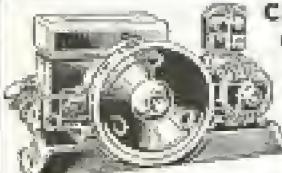
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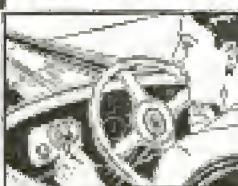
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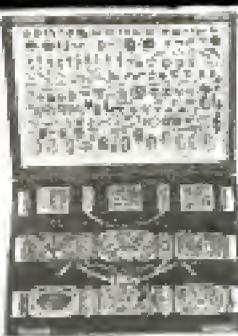
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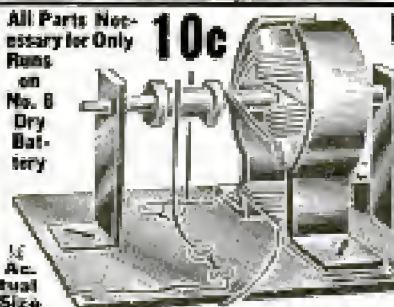
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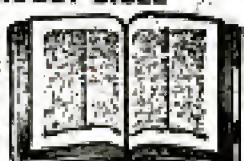
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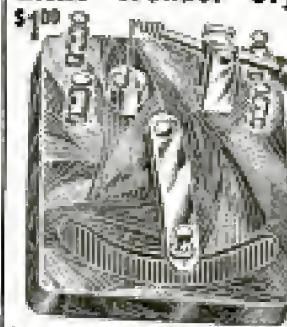
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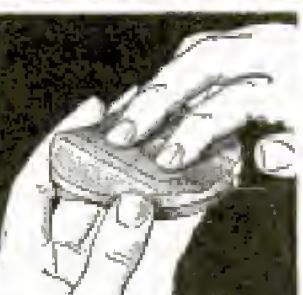
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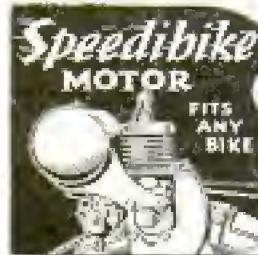


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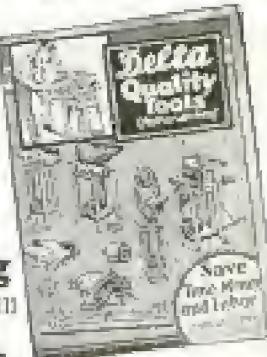
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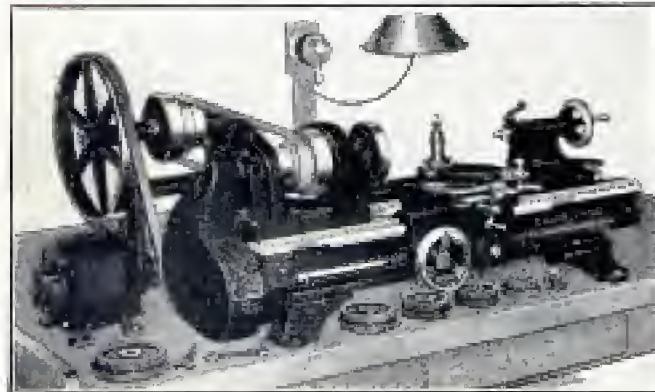
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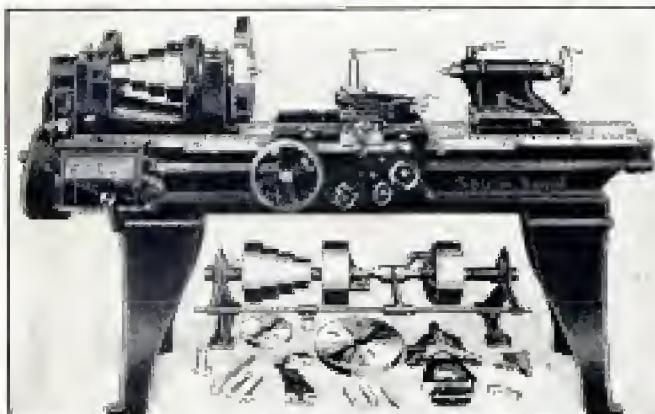
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